

UNCLASSIFIED

DEPARTMENT OF THE AIR FORCE

SUPPORTING DATA FOR FISCAL YEAR 1999 AMENDED BUDGET ESTIMATES

RESEARCH, DEVELOPMENT, TEST AND EVALUATION

DESCRIPTIVE SUMMARIES



FEBRUARY 1998

VOLUMES I, II, & III

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**DESCRIPTIVE SUMMARIES FOR PROGRAM ELEMENTS OF
THE DEPARTMENT OF THE AIR FORCE RESEARCH AND DEVELOPMENT PROGRAM
FY1999 AMENDED BUDGET ESTIMATES
FEBRUARY 1998**

INTRODUCTION AND EXPLANATION OF CONTENTS

1. (U) GENERAL. This document has been prepared to provide information on the United States Air Force (USAF) Research, Development, Test and Evaluation (RDT&E) program elements and projects in the FY1999 President's Budget Submission (PB), except those listed in paragraph 2 - 4 below. All formats in this document are in accordance with the revised guidelines of the DoD Financial Management Regulation, Volume 2B, Chapter 5, insofar as possible.
 - a. Contents: Exhibits R-2 and R-3 provide narrative information for all RDT&E program elements and projects within the USAF FY1999 RDT&E program except the classified program elements. The formats and contents of this documents are in accordance with the guidelines and requirement of the Congressional committees insofar as possible.
 - b. The "Other Program Funding Summary" portion of the R-2 includes, in addition to RDT&E funds, Procurement funds and quantities, Military Construction appropriation funds on specific development programs, Operations and Maintenance appropriation funds where they are essential to the development effort described, and where appropriate, Department of Energy (DOE) costs.
 - c. Volume III contains the Facilities exhibit (DoD Form 1391) and Combating Terrorism exhibit.

2. (U) CLASSIFICATION.
 - a. All R-2 and R-3 exhibits contained in Volumes I and II are UNCLASSIFIED. Classified R-2 and R-3 exhibits are not included in the submission due to the level of security classification and necessity of special security clearances.

3. (U) COMPARISON OF FISCAL YEARS 1998 AND 1999 DATA. A direct comparison of Fiscal Years 1998 and 1999 data shown in this document with corresponding data in the descriptive summaries dated February 1997 will reveal differences. The table highlights the relationship of the FY 1999 budget structure to the FY 1998 budget approved by Congress.

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PROGRAM ELEMENT COMPARISON SUMMARY

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Program Element

Remarks

BUDGET ACTIVITY 1: BASIC RESEARCH

No changes

BUDGET ACTIVITY 2: APPLIED RESEARCH DEVELOPMENT

0602201F Phillips Laboratory Exploratory Dev Project 4397 terminates in FY99

0602202F Armstrong Laboratory Exploratory Dev Project 1900 terminates in FY99
Project 7755 terminates in FY99

0602203F Aerospace Propulsion Project 3012 New Start in FY99

0602204F Aerospace Avionics Project 2001 terminates in FY99

0602702F Command, Control & Communication Project 2338 terminates in FY99

0602805F Dual Use Applications Program Project 4770 New Start in FY99

0603852F CV-130J DEM/VAL Project 4025 terminates in FY99

0603856F AF NRO Partnership Project 4782 New Start in FY99

BUDGET ACTIVITY 3: ADVANCE TECHNOLOGY DEVELOPMENT

0603106F Logistics Systems Technology In FY99 and out, Projects 2745, 2940 and 2950 have been
combined into Project 2745

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0603108F Integrated Data Systems	Transferred to PE 78611F, Project 4654
0603253F Advanced Avionics Integration	Software reuse efforts from Project 3833 transferred to Project 2735

BUDGET ACTIVITY 4: DEMONSTRATION AND VALIDATION

0603441F Space Based IR Arch (Dem/Val) (Space)	Project 0008 completed in FY98
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0603852F C-130J Dem/Val	Project 4025 terminates in FY98
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0603853F EELV D/V (Space)	Completed in FY98
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0603860F Joint Precision & Landing Systems Dem/Val	New Start in FY99
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0603876F Space Base Laser Systems Dem/Val	New Start in FY99
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BUDGET ACTIVITY 5: ENGINEERING AND MANUFACTURING DEVELOPMENT

0207414F Combat Intelligence System	PEs 0604321F, 0207431F and 0305158F have been consolidated into PE 0207414F, Project 2758
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0604201F Integrated Avionics Planning and	Project 2258 completes in FY99
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0604218F Engine Model Derivation Program	Project 2634 terminates in FY99
0604227F Flight Simulator Dev	Project 4673 New Start in FY99 Projects 2325 and 2769 terminate in FY99
0604243F Manpower, Personnel and Training	Projects 3818 and 4369 terminate in FY99
0604441F Space Base IR Arch	Project 4598 transferred to PE 0604442F in FY99
0604442F Space Based Infrared Sys (SBIRS) Low	New Start in FY99, Funds transferred from PE 0604441F
0604602F Armament Ordnance Dev	MMHE moved from SEEK EAGLE (PE 0207590F/ Project 2784) to Armament Ordnance Development to align funding with ASC/CC decision to move MMHE out of the SEEK EAGLE program office.
0604611F Joint Standoff Land Attack Missile	Per Congressional direction funds are held for administrative reasons in PE 0207325F, Project 4515 pending completion of Alternative of Analysis
0604740F Computer Resource Technology	Project 2522 terminates in FY99
0604762F Common Low Observable Verification System	Project 4683 New Start in FY99
0604805F Duap Commercial Operations	New Start in FY99
0605011F RDT&E for Aging Aircraft	New Start in FY99

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0605704F Theater Air Defense BMC41 Transfer to JTAMDO, PE 0605126J

BUDGET ACTIVITY 6: RDT&E MANAGEMENT SUPPORT

0603402F Space Test Program Transferred to PE 0605864F beginning in FY99

0605853F Environmental Conservation Transferred to O & M, PE 0702896F for non-test-specific base operations support

0605854F Pollution Prevention All funds for Test Facility base operations support transferred to O&M, PE 0702896F

0605856F Environmental Compliance Transferred to O&M, PE 0702896F for non-test-specific base operations support

0605876F Minor Construction Transferred to O&M, PE 0702896F for non-test-specific base operations support

0605878F Maintenance and Repair Transferred to O&M, PE 0702896F for non-test-specific base operations support

0605896F Real Property Services Transferred to O&M, PE 0702896F for non-test-specific base operations support

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BUDGET ACTIVITY 7: OPERATIONAL SYSTEM DEVELOPMENT

0102325F Joint Surveillance System	Projects 2976 and 4559 moved to PE 0102326F, Project 4592
0207131F A-10 Squadrons	Project 3861 New Start in FY99
0207217F Podded Reconnaissance System	Project 4611 completed in FY98
0207590F Seek Eagle	Project 2784 moved from Seek Eagle to Armament Ordnance Development (PE 0604602F/ Project 4696)
0207601F USAF Wargaming & Simulation	Project 1011 transferred to PE 0308610F Project 2888 transferred to PE 0207590F Project 4567 FY99 New Start
0207605F Wargaming & Simulation Center	New Program Element in FY99. FY98 funds in PE 27601F
0208030F WRM-Ammunition	Combined with 0207323F
0208019F Tactical Information Program	Project 4778 New Start in FY99
0208031F WRM-Equipment/Secondary Items	Project 4668 New Start in FY99
0302015F E-4B National Airborne Operations	Project 4777 New Start in FY99
0303131F Minimum Essential Emergency Communications Network	Project 4610 New Start in FY99

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0303140F Information Systems Security Program	Project 4579 New Start in FY99
0303144F Electromagnetic Compatibility	Project 649E was transferred to DISA, PE 0303153K.
0303150F WWMCCS/Global Command	FY99 and out year funding transferred from 0303152F. PE title changed from Automated Data Processing Equipment
0303152F Automated Data Processing Equipment	Transferred to PE 0303150F
0305099F Global Air Traffic Management (GATM)	Projects 4689 and 4690 New Start in FY99
0305158F Tactical Terminals	Project 4394 moved to PE 0207414F, Project 2758
0305176F Combat Survivor Evader Locator	FY98 and prior years were funded in PE 0603853F and PE 0603854F
0305910F Spacetrack	Project 4241 completed in FY98
0305953F Evolved Expendable Launch Veh (Space)	New Start in FY99
0308601F Modeling & Simulation Support	New Start in FY99
0401119F C5 Airlift Squadrons	Project 4495 name change to Avionics Modernization Program
0401218F KC-135S	Project 4286 New Start in FY99

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0708071F Joint Log Program-Ammunition	New Start in FY99. FY97 and FY98 funds reclassified from O&M to RDT&E
0708611F Support Systems Development	Project 4654 New Start in FY99. Funds transferred from 0603018F
0803734F Crypto/Sigint Related Skill	Project 1005 completes in FY99
1001018F NATO JSTARS	Project 0002 terminates in FY99

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National Airspace System	0305137F	1599
National Polar-orbiting Operational Environmental Satellite System (NPOESS) (Space)	0603434F	539
Navstar Global Pos Sys (User Eq) (Space)	0305164F	1635
NATO Cooperative Research and Development	0603790F	585

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PROGRAM ELEMENT TITLE	PE	PAGE
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NAVSTAR GPS (Space)	0305165F	1643
NCMC-TW/AA Systems	0305906F	1667
North Atlantic Defense System (NADS)	0102411F	1245
Nuclear Weapons Support	0604222F	745
Nudet Detection System	0305913F	1713
Personnel, Training, and Simulation Technology	0603227F	315
Phillips Laboratory Exploratory Development	0602601F	163
Podded Reconnaissance System (PRS)	0207217F	1297
Polar Adjunct (Space)	0603432F	535
Pollution Prevention	0605854F	1179
Product/Reliable/Avail/Maintain Prog	0708026F	1805
Ranch Hand II Epidemiology Study	0605306F	1143
RAND Project Air Force	0605101F	1139
RDT&E FOR AGING AIRCRAFT	0605011F	1095
Region/Sector Operations Control Center Modernization Program	0102326F	1239
Rocket System Launch Program (Space)	0605860F	1183
Satellite Control Network (Space)	0305110F	1559
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Space Based IR Arch (Dem/Val) (Space)	0603441F	545
Space Based IR Arch (EMD) (Space)	0604442F	899
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PROGRAM ELEMENT TITLE	PE	PAGE
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Space Systems Environmental Interactions Technology	0603410F	403
Space Test Program (Space)	0603402F	1101
Space Test Program (Space)	0605864F	1187
Spacetrack (Space)	0305910F	1683
Specialized Undergraduate Pilot Trng	0604233F	797
Submunitions	0604604F	941
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Tactical AIM Missile	0207161F	1281
Tactical Information Program	0208019F	487
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Theater Air Control System	0207412F	1327
Theater Battle Management (TBM) C4I	0207438F	1363
Theater Missile Defense	0208060F	1445
Threat Simulator Development	0604256F	1105
Titan Space Launch Vehicles (Space)	0305144F	1611
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USAF Modeling and Simulation	0207601F	1401
Variable Stability In-Flight Simulation Test Aircraft	0604237F	703
Wargaming and Simulation Centers	0207605F	1419
Weather Service	0305111F	1567
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ALPHABETICAL LISTING

PROGRAM ELEMENT TITLE	PE	PAGE
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE **February 1998**

BUDGET ACTIVITY

PE NUMBER AND TITLE

1 - Basic Research

0601102F Defense Research Sciences

COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	182,082	196,251	209,395	228,104	230,992	234,718	239,378	Continuing	Continuing
2301 Physics	18,479	20,525	20,756	21,702	21,973	22,320	22,756	Continuing	Continuing
2302 Solid Mechanics and Structures	12,087	13,588	15,380	16,077	16,273	16,530	16,853	Continuing	Continuing
2303 Chemistry	25,573	27,069	25,908	27,164	27,574	28,087	28,707	Continuing	Continuing
2304 Mathematical and Computer Sciences	28,919	27,401	34,525	45,239	45,807	46,540	47,449	Continuing	Continuing
2305 Electronics	21,129	24,788	23,473	24,543	24,850	25,244	25,738	Continuing	Continuing
2306 Structural Materials	11,730	14,017	12,160	12,708	12,861	13,063	13,318	Continuing	Continuing
2307 Fluid Mechanics	8,453	11,573	7,212	7,529	7,618	7,736	7,886	Continuing	Continuing
2308 Propulsion	10,075	9,830	18,675	19,524	19,765	20,078	20,470	Continuing	Continuing
2310 Atmospheric Sciences	7,239	6,244	5,562	5,802	5,868	5,958	6,075	Continuing	Continuing
2311 Space Sciences	4,628	4,320	6,827	7,127	7,211	7,321	7,464	Continuing	Continuing
2312 Biological Sciences	12,241	13,917	13,065	13,654	13,821	14,036	14,312	Continuing	Continuing
2313 Human Performance	8,729	7,877	12,567	13,133	13,292	13,500	13,764	Continuing	Continuing
4113 Science and Engineering Education Programs	12,800	15,102	13,285	13,902	14,079	14,305	14,586	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences
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(U) **A. Mission Description and Budget Item Justification:** This Basic Research program, managed by the Air Force Office of Scientific Research (AFOSR), supports Air Force research efforts comprised of in-house investigations in Air Force laboratories and extramural activities in academia and industry. The program element funds broad-based scientific and engineering basic research in technologies critical to the Air Force mission. These technologies include aerospace structures, aerodynamics, materials, propulsion, power, electronics, computer science, directed energy, conventional weapons, life sciences, and atmospheric and space sciences. All projects are coordinated through the Reliance process to harmonize efforts, eliminate duplication, and ensure the most effective use of funds. All technology areas are subject to long-range research planning and technical review by tri-Service scientific planning groups that interface and support the Defense Technology Area Planning process.

(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	210,763	226,832	230,210	Cont
(U) Appropriated Value	219,475	207,249		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-4,597	-6,856		
b. SBIR	-4,115	-4,142		
c. Omnibus/Other Above Threshold Reprogrammings	-27,552			
d. Below Threshold Reprogrammings	-901			
e. Rescissions	-228			
(U) Adjustments to Budget Year Since FY 1998 PB			-20,815	
(U) Current Budget Submit/FY 1999 PB	182,082	196,251	209,395	Cont

(U) **Change Summary Explanation:**
 Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.
 Schedule: Not Applicable.
 Technical: Not Applicable.

(U) **C. Other Program Funding Summary:** Not Applicable.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2301
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2301 Physics	18,479	20,525	20,756	21,702	21,973	22,320	22,756	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification:** This project provides the fundamental knowledge required to conceptualize and develop new Air Force weapons and also establishes the basis for many technologies critical to the Air Force. Research in physics has an impact on electromagnetic countermeasures, nuclear weapons effects, communications, and non-destructive and non-intrusive testing and analysis, as well as new materials development. Other technologies affected include avionics, laser technology, and propulsion research. The primary areas of research supported by this project are Photonic Physics, Optics, Plasma Physics, and Atomic and Molecular Physics.

(U) FY 1997 (\$ in Thousands):

- (U) \$8,518 Performed laser and optical physics research for aerospace applications.
 - (U) Demonstrated infrared laser devices for application to spoofing infrared missile seekers.
 - (U) Devised and demonstrated efficient laser wavelength converters based on newly developed nonlinear optical materials. Higher efficiency enables more compact target designators and illuminators.
 - (U) Examined innovative, laser-assisted processing techniques to reduce the processing time and cost of micro-electromechanical systems (MEMS) for control, sensing, and health monitoring applications in mini-satellites.
- (U) \$4,352 Conducted plasma physics research for future directed-energy weapons, affordable low-observables, and space communications and surveillance.
 - (U) Identified the critical importance of high-vacuum conditions to reliable long-pulse operation of ultrahigh power microwave sources for enemy air defense suppression.
 - (U) Established validity of highly collisional ionized gas to serve as a low-cost, switchable, broadband microwave (radar) absorber.
- (U) \$5,609 Studied atomic, molecular, and imaging physics to enhance space surveillance capabilities.
 - (U) Extended existing imaging techniques to the physical limits for monitoring space debris and space assets for deep-space surveillance.
 - (U) Devised theory for power requirement versus pulse format for artificial, guide-star adaptive telescope development.
- (U) \$18,479 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences PROJECT 2301	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$7,456	Perform laser and optical physics research for aerospace applications.	
	– (U) Intensify research in lasers and optical devices for spoofing and damaging infrared seeking missiles.	
	– (U) Examine physics of lethal and nonlethal directed-energy for speed-of-light target kill.	
	– (U) Direct studies toward developing optimum lasers for high-image quality telescopes for space surveillance.	
– (U) \$4,840	Conduct plasma physics research for future directed-energy weapons, affordable low-observables, and space communications and surveillance.	
	– (U) Study the power limits and frequency ranges achievable by multi-beam microwave sources; transition results for Airborne Warning and Control System (AWACS) upgrades.	
	– (U) Reduce the total electrical power required to maintain high-pressure ionized gas volumes necessary for air and space low-observable applications.	
– (U) \$5,229	Study atomic, molecular, and imaging physics to enhance space surveillance capabilities.	
	– (U) Enhance concepts for precision time and frequency standards, enabling high data rate communication and advanced navigation.	
	– (U) Improve spatial and spectral imaging for space surveillance and targeting precision.	
– (U) \$3,000	Perform basic research in adaptive optics for application in advanced ground-based telescopes.	
– (U) \$20,525	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$9,578	Perform laser and optical physics research for aerospace applications.	
	– (U) Expand knowledge of lasers and optical devices for infrared countermeasures applications.	
	– (U) Identify advanced applications of laser physics and devices for directed-energy weapons.	
– (U) \$4,886	Conduct plasma physics research for future directed-energy weapons, affordable low-observables, and space communications and surveillance.	
	– (U) Advance state-of-the art in explosive-driven power generators, enabling future self-contained airborne directed-energy weaponry.	
	– (U) Examine the scientific feasibility of using collisional ionized gas volumes to protect friendly assets from directed-energy weapon threats.	
– (U) \$6,292	Study atomic, molecular, and imaging physics to enhance space surveillance capabilities.	
	– (U) Develop advanced atomic and molecular processes to produce ideal performance time standards.	
	– (U) Investigate unconventional imaging approaches for surveillance and target detection and recognition.	
– (U) \$20,756	Total	
Project 2301	Page 4 of 42 Pages	Exhibit R-2 (PE 0601102F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2301
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	18,503	20,362	20,680	Cont
(U) Current Budget Submit/FY 1999 PB	18,479	20,525	20,756	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602203F, Aerospace Propulsion.
- (U) PE 0602601F, Phillips Laboratory.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2302
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2302 Solid Mechanics and Structures	12,087	13,588	15,380	16,077	16,273	16,530	16,853	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project seeks to develop a fundamental understanding of the behavior of aerospace materials, structures, and supporting facilities, leading to cost-effective development and safe and reliable operation of superior weapons and defensive systems. Research includes such diverse topics as the micromechanical design of advanced materials, modeling and simulation of the dynamic behavior of aircraft, missiles, and large space structures, and technology integration for the performance and survivability enhancement of these systems. This research will result in expanding the fundamental knowledge base to better understand the mechanics of deformation and damage of aerospace materials and structures. Also, this research will lead to an improved understanding of the aeroelastic and acoustic behavior of airframe and engine structures, and the dynamic behavior of launch vehicles and space structures.

(U) FY 1997 (\$ in Thousands):

- (U) \$4,442 Studied thermomechanical behavior of advanced structural materials to enhance the longevity and performance of aerospace vehicles and structures.
 - (U) Performed research into micromechanics of high-temperature composite materials for use in wing and fuselage structures.
 - (U) Developed models for three-dimensionally reinforced composite materials. Models provide for performance testing and predictive modeling, eliminating steps involved in the manufacture of full-scale prototypes.
- (U) \$4,080 Modeled development of materials needed for aerospace structures.
 - (U) Researched scaling issues in structural mechanics and developed necessary computational techniques for handling homogenization in modeling and simulations. Homogenization techniques are computationally very fast and efficient.
 - (U) Investigated the fundamental behavior of vibro/acoustic systems and aeroelastic structures to apply toward reduction of noise and structural fatigue in aircraft with internal bomb bays (B-1, F-22, Joint Strike Fighter).
- (U) \$3,565 Gained fundamental particulate mechanics knowledge to improve weapons performance.
 - (U) Developed a first principles understanding of the behavior of geomaterial fracture mechanics and damage accumulation. First used in "Live Fire" computer codes to support "smart bomb" testing.
 - (U) Investigated strain rate versus confining pressures of geomaterials impacted by penetrating weapons, for optimization of weapon design and targeting variables. Small "smart bomb" test validated concepts.
- (U) \$12,087 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences PROJECT 2302	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$4,994	Study thermomechanical behavior of advanced structural materials to enhance the longevity and performance of aerospace vehicles and structures.	
	– (U) Research the micromechanics of high-temperature composite materials for aerospace structural systems and coatings.	
	– (U) Investigate the fracture behavior and thermomechanical behavior of high temperature alloys and composite materials for engine and hypersonic vehicle applications.	
– (U) \$4,586	Model development of materials needed for aerospace structures.	
	– (U) Examine issues related to dynamics and mechanics of materials at very small scales, as necessary for the development of micro-electromechanical systems.	
	– (U) Research the fundamental behavior of actuator/structure interaction for control of shell structures in vibro/acoustic environments.	
	– (U) Develop a fundamental understanding of the behavior of aeroelastic structures to apply toward reduction of noise and structural fatigue in aircraft.	
– (U) \$4,008	Seek fundamental particulate mechanics knowledge to improve weapons performance.	
	– (U) Obtain quantitative relationships to describe the fundamental mechanics governing the behavior of geomaterial systems.	
	– (U) Investigate the fundamental relationship of geomaterials undergoing high strain rate loadings with increasing confining pressures, as occurs when impacted by penetrating weapons.	
– (U) \$13,588	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$5,652	Study thermomechanical behavior of advanced structural materials to enhance the longevity and performance of aerospace vehicles and structures.	
	– (U) Perform research in the micromechanics of high-temperature composite materials for aerospace structural systems and coatings.	
	– (U) Investigate the fracture behavior and thermomechanical behavior of high temperature alloys and composite materials for engine and hypersonic vehicle applications.	
– (U) \$5,191	Model development of materials needed for aerospace structures.	
	– (U) Predict the dynamic and material behavior of structures for micro-electromechanical systems.	
	– (U) Determine the response of shell structures in vibro/acoustic environments.	
	– (U) Control the response of aeroelastic structures to apply toward reduction of noise and structural fatigue in aircraft.	
– (U) \$4,537	Seek fundamental particulate mechanics knowledge to improve weapons performance.	
	– (U) Investigate quantitative relationships that describe the fundamental mechanics governing the behavior of geomaterial systems.	
	– (U) Predict the trajectory and penetration depth of earth penetrator weapons using advanced computational models.	
– (U) \$15,380	Total	
Project 2302	Page 7 of 42 Pages	Exhibit R-2 (PE 0601102F)

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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2302
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	14,384	15,608	15,838	Cont
(U) Current Budget Submit/FY 1999 PB	12,087	13,588	15,380	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0602203F, Aerospace Propulsion.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 1 - Basic Research				PE NUMBER AND TITLE 0601102F Defense Research Sciences				PROJECT 2303		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2303	Chemistry	25,573	27,069	25,908	27,164	27,574	28,087	28,707	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: In the chemistry research program, knowledge and understanding is sought in chemical synthesis and reactivity, polymer chemistry, surface science, and molecular dynamics. The focus is on building the knowledge base required to develop new materials and to improve the synthesis of existing materials. Specific research focus areas include functional and structural materials, electronic and photonic materials, biomimetic materials, electromagnetic and conventional weaponry, propellants, and environmentally safer materials. This program conducts novel synthesis and characterization of higher performance and lower cost nonmetallic and biomimetic materials for application as infrared sensors, and safer, more efficient fire suppressants and deicer/anti-ice materials, and mechanistic studies of biological corrosion and semiconductor nanolithography. The chemistry program also investigates effects of chemical and morphological structures on functional and mechanical properties of polymeric materials. The program also explores atomic and molecular surface interactions that can limit performance of electronic devices, compact power sources, and lubricant materials, and investigates molecular energy release mechanisms and energy storage in metastable molecular systems to foster advances in laser weapons development and new chemical propellants.</p> <p>(U) FY 1997 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$7,672 Studied chemical synthesis of compounds with tailored functional and structural properties for improved aerospace vehicle performance. <ul style="list-style-type: none"> - (U) Developed photorefractive polymers for aerospace applications such as protection from laser threats, optical target recognition and tracking, and laser power amplification. - (U) Investigated effects of solvation and condensed media on chemical synthesis of energetic materials used for advanced propulsion systems. - (U) \$7,161 Investigated chemical process at surfaces and interfaces to improve performance and maintainability of Air Force systems. <ul style="list-style-type: none"> - (U) Investigated mechanisms of chemical corrosion of aluminum for aging aircraft preservation. - (U) Formulated molecular-level model for simulating the behavior of hydrocarbon-based lubricants in aircraft and spacecraft operating in extreme temperature and pressure environments. - (U) \$10,740 Performed research on molecular-level energy transfer, energy extraction, and chemical reactivity research for advanced aerospace applications. <ul style="list-style-type: none"> - (U) Developed high-energy, photo-pumped, gas-phase mid-infrared laser systems for aircraft protection. - (U) Identified source of pure-rotational infrared emission from atmospheric radicals, enabling determination of atmospheric optical backgrounds for surveillance systems. - (U) Determined key chemical reactions to accelerate ignition in hypersonic vehicle engines. - (U) \$25,573 Total 										
Project 2303		Page 9 of 42 Pages				Exhibit R-2 (PE 0601102F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		February 1998
1 - Basic Research	PE NUMBER AND TITLE	PROJECT
	0601102F Defense Research Sciences	2303
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$8,121	Study chemical synthesis of compounds with tailored functional and structural properties for improved aerospace vehicle performance.	
	– (U) Design ideal polymer blends for structural and functional applications such as impact-resistant composites, high-temperature toughened canopies, and power-efficient flat panel displays.	
	– (U) Investigate molecules possessing efficient two-photon processes, enabling laser hardening, optical data storage, and advanced imaging techniques.	
	– (U) Design and synthesize novel inorganic polymer systems for enhanced rocket motor insulation.	
– (U) \$7,579	Investigate chemical process at surfaces and interfaces to improve performance and maintainability of Air Force systems.	
	– (U) Develop novel methods for non-intrusive detection of hidden corrosion in aluminum elements of aging aircraft.	
	– (U) Investigate surface growth and characterization processes of thin films coatings for prevention of aircraft corrosion.	
– (U) \$11,369	Perform research on molecular-level energy transfer, energy extraction, and chemical reactivity research for advanced aerospace applications.	
	– (U) Create lightweight, chemical laser systems for missile defense applications.	
	– (U) Investigate effects of ion reactions with hydrocarbon fuels on combustion initiation in hypersonic vehicle engines.	
	– (U) Develop novel technique to probe bonding in ceramic materials. Technique will enable development of improved thermal-barrier coatings in aircraft engines.	
– (U) \$27,069	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$7,772	Study chemical synthesis of compounds with tailored functional and structural properties for improved aerospace vehicle performance.	
	– (U) Investigate the long-term durability of polymers that operate in extreme environments such as in air-breathing propulsion systems, and aerospace vehicles operating in low earth orbit or deep space.	
	– (U) Develop organic coatings for aircraft protection applications that can withstand chemical and photochemical deterioration.	
	– (U) Create functional polymers for optical signal processing and advanced control of phased-array radar and laser radar.	
– (U) \$7,255	Investigate chemical process at surfaces and interfaces to improve performance and maintainability of Air Force systems.	
	– (U) Formulate an atomistic model for corrosion prevention in aluminum aircraft components.	
	– (U) Develop new vapor phase lubricants for operation in extreme temperature environments.	
– (U) \$10,881	Perform research on molecular-level energy transfer, energy extraction, and chemical reactivity research for advanced aerospace applications.	
	– (U) Investigate high-energy, metastable molecular states for use in advanced rocket propulsion systems.	
	– (U) Develop and apply methods for simulating molecular energy transfer in extreme aerospace environments to predict and interpret aircraft and spacecraft signatures.	
Project 2303	Page 10 of 42 Pages	Exhibit R-2 (PE 0601102F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2303		
<p>– (U) Investigate formation and stability of molecular clusters for use as nanoscale sensors in aircraft and uninhabited air vehicles.</p> <p>– (U) \$25,908 Total</p>				
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>
(U) Previous President's Budget (FY 1998 PB)	30,560	31,096	31,764	Cont
(U) Current Budget Submit/FY 1999 PB	25,573	27,069	25,908	Cont
(U) Change Summary Explanation:				
Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
– (U) PE 0602102F, Materials.				
– (U) PE 0602601F, Phillips Laboratory.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 1 - Basic Research				PE NUMBER AND TITLE 0601102F Defense Research Sciences				PROJECT 2304				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2304 Mathematical and Computer Sciences				28,919	27,401	34,525	45,239	45,807	46,540	47,449	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This research focuses on mathematical modeling, simulation, and control of complex systems and provides analytical and computational methods. Topics include: effective utilization of high-performance computers; control of aerospace systems; models and computational tools for the design of aircraft, missiles, or other weapons; efficient production of large-scale, well documented computer programs and software; communication and information theory; signal processing; artificial intelligence in surveillance systems or independent weapons; reliability and maintainability; and the allocation of resources in logistics or operational activities using ideas from optimization and linear programming theories.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$9,833 Studied physical mathematics, control, and signal processing supporting the Air Force's New World Vista (NWV) programs. <ul style="list-style-type: none"> - (U) Developed a new, nonlinear controller design technology based on bifurcation theory. Technology is transitioning for advanced research and industrial applications for improved performance (including reduced stall limits) and reduced jet engine weights. - (U) Derived mathematical description and simulation capability of a new solid state laser design, known as a master oscillator power amplifier. Simulation capabilities promise to double the design's predicted laser output. - (U) \$10,410 Performed research on computer software and systems for battlespace information management. <ul style="list-style-type: none"> - (U) Developed formal methods for discovering errors in the specifications for distributed system software in embedded avionics systems. The research advances the capability to produce error-free software. - (U) Created automated tools for browsing open source information, including the World Wide Web, for intelligence analysis. - (U) \$8,676 Investigated computational science for improved design and simulation of advanced aerospace systems. <ul style="list-style-type: none"> - (U) Derived new adaptive algorithms for the accurate numerical prediction of radar scattering from realistic air vehicles. Built an automatic interface to existing computer assisted design (CAD) files, which drastically speeds the computational process. - (U) Developed a new, fast algorithm to calculate design sensitivities in complex systems of nonlinear partial differential equations. This will enable effective use of optimal design strategies in a wide range of aerospace systems. - (U) \$28,919 Total 												
Project 2304				Page 12 of 42 Pages				Exhibit R-2 (PE 0601102F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences PROJECT 2304	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$9,316	Study physical mathematics, control, and signal processing supporting the Air Force's New World Vista (NWV) programs.	
	– (U) Explore new concepts of differential flatness for fast, on-line trajectory generation for aggressive flight in unmanned combat air vehicles.	
	– (U) Develop appropriate multi-resolution methods, including time-frequency analysis and the generalizations of Fourier and wavelets transforms, for use in military signal transmission and reduced signature automatic target recognition scenarios.	
– (U) \$9,865	Perform research on computer software and systems for battlespace information management.	
	– (U) Develop scientific foundations to permit integration of information from radically different sources for global battlefield awareness.	
	– (U) Investigate methods to support the utilization of secure, transportable software agent technology in command and control networks.	
– (U) \$8,220	Investigate computational science for improved design and simulation of advanced aerospace systems.	
	– (U) Derive higher order numerical methods for the time-accurate computation of non-smooth, unsteady flows, minimizing reliance upon steady flow approximations. This will lead to optimal design capabilities for jet engine combustors and other aircraft systems.	
	– (U) Develop a mathematical infrastructure for robust virtual engineering to radically improve Air Force modeling and simulation capabilities in the presence of multiple uncertainties such as random disturbances or numerical errors.	
– (U) \$27,401	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$11,738	Study physical mathematics, control, and signal processing supporting the Air Force's NWV programs.	
	– (U) Develop modeling, identification, control, and signal processing capabilities necessary for the integrated control of jet engine, aerodynamic, and combustor instabilities. This will lead to lighter weight engines with greatly improved performance characteristics.	
	– (U) Expand efforts in mathematical modeling of advanced materials, including composites and smart skins containing shape memory alloys.	
– (U) \$12,429	Perform research on computer software and systems for battlespace information management.	
	– (U) Expand research in transportable agent technology to support defensive information warfare applications.	
	– (U) Expand research in real-time problem solving strategies to support dynamic planning and execution.	
– (U) \$10,358	Investigate computational science for improved design and simulation of advanced aerospace systems.	
	– (U) Integrate new multidisciplinary optimization design strategies with higher order, time accurate flow solvers for improved design of jet engines and other aerospace components.	
	– (U) Develop algorithms incorporating active control procedures involving magnetohydrodynamics, shock shape modification, and shock shape manipulation.	
– (U) \$34,525	Total	
Project 2304	Page 13 of 42 Pages	Exhibit R-2 (PE 0601102F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2304															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">30,828</td> <td style="text-align: center;">34,254</td> <td style="text-align: center;">34,859</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">28,919</td> <td style="text-align: center;">27,401</td> <td style="text-align: center;">34,525</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602201F, Aerospace Flight Dynamics. - (U) PE 0602702F, Command, Control, and Communications. - (U) PE 0603728F, Advanced Computer Technology. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY 1998 PB)	30,828	34,254	34,859	Cont	(U) Current Budget Submit/FY 1999 PB	28,919	27,401	34,525	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>													
(U) Previous President's Budget (FY 1998 PB)	30,828	34,254	34,859	Cont													
(U) Current Budget Submit/FY 1999 PB	28,919	27,401	34,525	Cont													
Project 2304	<i>Page 14 of 42 Pages</i>	Exhibit R-2 (PE 0601102F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2305
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2305 Electronics	21,129	24,788	23,473	24,543	24,850	25,244	25,738	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Research in this project emphasizes electronic devices and systems that enable new Air Force capabilities such as battle information management systems, countermeasures, sensors, and the more electric aircraft concept. The goals are to increase the data and information processing speed of electronic systems, to firmly control their complexity and reliability, and to improve the security and reliability of information and data transmission. Research is conducted in electronic processes which will enable the engineer to model and predict performance of electronic materials, devices, and systems for high-speed digital and analog signal processing, microwave and millimeter wave signal and power generation, superconducting, optical signal processing, and radiation effects.

(U) FY 1997 (\$ in Thousands):

- (U) \$11,388 Studied semiconductor electronic materials, advanced devices, and applications.
 - (U) Investigated new device and circuit concepts based on three-dimensional integration; enables functionally superior and lower-cost electronic systems.
 - (U) Examined radiation hardening of electronic and optoelectronic devices and systems. Hardening increases survivability and mission lifetimes of space-borne systems.
- (U) \$6,085 Sought fundamental understanding of optoelectronic information processing and storage.
 - (U) Identified opportunities to tailor electronic and photonic properties in artificial, three-dimensionally ordered structures, leading to compact, functionally flexible sensors.
- (U) \$3,656 Investigated superconducting and nanoscopic materials, devices and applications.
 - (U) Developed manufacturable process for fabricating high-temperature superconducting (HTS) Josephson junctions. Useful for applications such as frequency-agile phased arrays.
 - (U) Devised technique for observing active corrosion in aluminum aerospace structures. Provides a non-destructive, cost-effective, evaluation process.
- (U) \$21,129 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2305
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$13,360 Study semiconductor electronic materials, advanced devices, and applications. <ul style="list-style-type: none"> - (U) Investigate non-stoichiometric compound semiconductor materials and devices, leading to low-power, radiation-tolerant systems. - (U) Enhance materials processing of nitride compounds for new solar-blind sensors. - (U) \$7,137 Seek fundamental understanding of optoelectronic information processing and storage. <ul style="list-style-type: none"> - (U) Examine spectral hole burning memories, promising orders-of-magnitude enhancement in information storage. - (U) Investigate micro-lasers needed to solve electronic interconnection problems, as device density and complexity increase. - (U) \$4,291 Investigate superconducting and nanoscopic materials, devices and applications. <ul style="list-style-type: none"> - (U) Identify lower limit of surface resistance. - (U) Investigate Josephson junction arrays as possible terahertz radiation sources for surveillance applications. - (U) Fabricate new nanometer-scale magnetic structures for use in compact, energy-efficient electronics. - (U) Apply superconducting magnetic sensors to non-destructive evaluation of aerospace structures. - (U) \$24,788 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$12,659 Study semiconductor electronic materials, advanced devices, and applications. <ul style="list-style-type: none"> - (U) Enhance research on interface control and stability in semiconductor quantum structures for improved laser and detector applications, including low-photon count photo receivers. - (U) Investigate novel methods to electronically tailor compound semiconductors, to obtain complementary electron-device structures for ultra-high frequency logic circuits. - (U) Examine high-temperature electronics for use in hostile environments. - (U) \$6,757 Seek fundamental understanding of optoelectronic information processing and storage. <ul style="list-style-type: none"> - (U) Investigate advanced communications, signal processing, and computing. - (U) Examine novel micro-lasers and ultra-high density information storage and retrieval. - (U) \$4,057 Investigate superconducting and nanoscopic materials, devices and applications. <ul style="list-style-type: none"> - (U) Investigate superconducting microwave properties and devices for advanced communications. - (U) Develop quantum nanoelectronic and magnetic structures for higher speed signal processing and denser memory. - (U) Create higher current, high temperature, superconducting materials for power generation and storage on space platforms. - (U) \$23,473 Total 		
Project 2305	Page 16 of 42 Pages	Exhibit R-2 (PE 0601102F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2305
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	27,866	30,301	30,553	Cont
(U) Current Budget Submit/FY 1999 PB	21,129	24,788	23,473	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603728F, Advanced Computer Technology.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 1 - Basic Research			PE NUMBER AND TITLE 0601102F Defense Research Sciences					PROJECT 2306			
COST (\$ In Thousands)			FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2306	Structural Materials		11,730	14,017	12,160	12,708	12,861	13,063	13,318	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Research focuses on metallic, polymeric, and ceramic and nonmetallic structural materials. Materials research provides the knowledge for improving the performance, cost, and reliability of structural materials. Structural materials research studies a broad range of material properties such as strength, toughness, fatigue resistance, and corrosion resistance of airframe, turbine engine, and spacecraft materials. Emphasis is on refractory alloys, intermetallics, polymer composites, metal and ceramic matrix composites, and advanced ceramics, such as alumina, silicon carbide, silicon nitride, and carbon/carbon. Research in new processing methods complements research on materials properties. Direct goals of this program are to increase the operating temperature of engine materials which will further increase thrust-to-weight ratio of engines, develop improved aerospace vehicle structural materials, and control or eliminate advance material reliability issues related to high temperature strength, toughness, fatigue, and environmental conditions.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$6,217 Sought fundamental understanding of very-high temperature, non-metallic materials for air-breathing engine applications to support Integrated High Performance Turbine Engine Technology (IHPTET) and Integrated High Payoff Rocket Propulsion Technology (IHPRPT). <ul style="list-style-type: none"> - (U) Studied fundamentals of one of the best candidate materials for turbine engine applications; developed the best high-temperature creep resistant material to date -- yttrium-alumina garnet. - (U) Demonstrated a novel design and fabricated a self-reinforced silicon-nitride ceramic material. This material shows potential as one of the best structural materials known for high-temperature applications. - (U) \$4,222 Performed research on metallic systems for engines and airframe applications. <ul style="list-style-type: none"> - (U) Examined microstructural mechanisms responsible for anomalous engine, high-cycle fatigue behavior of Ti-based alloys. Examined interfacial stability of intermetallics and found novel approaches to improve ductility and fabricating engine parts for fighter aircraft. - (U) Discovered a novel structural material -- metallic glass -- which is lighter, stronger, and tougher than aluminum. Shows potential for airframe applications. - (U) \$1,291 Studied longevity of polymeric composites for advanced airframe applications. <ul style="list-style-type: none"> - (U) Studied degradation of polymeric materials due to extreme processing environments and operating conditions. - (U) Clarified relationship of chemical changes to long-term durability of composites. - (U) \$11,730 Total 											
Project 2306			Page 18 of 42 Pages				Exhibit R-2 (PE 0601102F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences PROJECT 2306	
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<p>– (U) \$7,569</p>	<p>Seek fundamental understanding of very-high temperature, non-metallic materials for air-breathing engine applications to support Integrated High Performance Turbine Engine Technology (IHPTET) and Integrated High Payoff Rocket Propulsion Technology (IHRPT).</p>	
	<p>– (U) Investigate oxide-oxide eutectics, novel ceramic materials with excellent high-temperature mechanical stability for turbine blades and combustor lining applications.</p>	
	<p>– (U) Investigate the new phenomenon of polycrystal-to single crystal conversion. Establish applicability of this novel phenomenon to turbine blade manufacturing.</p>	
<p>– (U) \$5,046</p>	<p>Perform research on metallic systems for engines and airframe applications.</p>	
	<p>– (U) Elucidate the atomic and microstructural mechanisms responsible for primary creep in titanium (Ti)-based alloys. The primary creep of Ti-alloys has been implicated as one of the major factors controlling the durability of turbine and compressor blades in Air Force engines.</p>	
	<p>– (U) Develop material solution to quantify and provide solution to high-cycle fatigue problem of Ti components in engines.</p>	
	<p>– (U) Study molybdenum-based alloys as possible candidates for turbine blade applications.</p>	
<p>– (U) \$1,402</p>	<p>Study reliability and aging of polymeric composites.</p>	
	<p>– (U) Conduct research on stress-induced change in solvent and moisture absorption behavior of polymer matrix composites.</p>	
	<p>– (U) Investigate the elements of chemical and molecular structures on degradation of polymer-matrix composites.</p>	
<p>– (U) \$14,017</p>	<p>Total</p>	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p>		
<p>– (U) \$6,444</p>	<p>Perform fundamental studies of very-high temperature, non-metallic materials for air-breathing engine and space vehicle applications.</p>	
	<p>– (U) Investigate coupled thermal and mechanical stability of very-high temperature oxide composites and eutectics for engine blade applications.</p>	
	<p>– (U) Investigate ultra-high temperature materials systems, based on carbides, for rocket propulsion applications.</p>	
<p>– (U) \$4,378</p>	<p>Perform research on metallic systems for engines and airframe applications.</p>	
	<p>– (U) Study thermal and mechanical stability of refractory metal systems for very-high temperature applications.</p>	
	<p>– (U) Investigate functionally gradient structures for thermal barrier coatings and turbine blade applications to reduce weight and to increase engine operating temperature.</p>	
<p>– (U) \$1,338</p>	<p>Study polymeric composites life and reliability.</p>	
	<p>– (U) Investigate free-volume effect in controlling moisture absorption mechanisms and rates in polymer matrix composites.</p>	
	<p>– (U) Research non-destructive evaluation techniques on adhesive-bonded structures to detect precursor conditions prior to damage initiation.</p>	
<p>Project 2306</p>	<p align="center">Page 19 of 42 Pages</p>	<p align="right">Exhibit R-2 (PE 0601102F)</p>

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2306															
<p>– (U) \$12,160 Total</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 15%;"><u>FY 1997</u></th> <th style="text-align: center; width: 15%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">15,081</td> <td style="text-align: center;">16,100</td> <td style="text-align: center;">16,338</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">11,730</td> <td style="text-align: center;">14,017</td> <td style="text-align: center;">12,160</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> – (U) PE 0602102F, Materials. – (U) PE 0603211F, Aerospace Structures. – (U) PE 0708011F, Manufacturing Technology. – (U) PE 0602203F, Aerospace Propulsion. – (U) PE 0602201F, Aerospace Flight Dynamics. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY 1998 PB)	15,081	16,100	16,338	Cont	(U) Current Budget Submit/FY 1999 PB	11,730	14,017	12,160	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>													
(U) Previous President's Budget (FY 1998 PB)	15,081	16,100	16,338	Cont													
(U) Current Budget Submit/FY 1999 PB	11,730	14,017	12,160	Cont													
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2307
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2307 Fluid Mechanics	8,453	11,573	7,212	7,529	7,618	7,736	7,886	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Research involves turbulence prediction and control, unsteady and separated flows, hypersonics, and internal fluid dynamics. This research provides fundamental knowledge, tools, data, concepts, and methods for improving the efficiency, effectiveness, and reliability of aerospace vehicles. Research provides an understanding of key fluid flow phenomena, improves theoretical models for aerodynamic prediction and design, and originates flow control concepts and predictive methods to expand current flight performance boundaries. Research includes the development of computational methods for complex flows, prediction of real gas effects in high-speed flight, control and prediction of turbulence in flight vehicles, propulsion systems, aero-optic applications, the dynamics of unsteady and separated flows, thrust vectoring and high lift concepts associated with enhanced performance and maneuverability, heat transfer and compressor instabilities in gas turbine engines, flow-structure interactions in both external and internal flows, and transport phenomena in structural materials processing.

(U) FY 1997 (\$ in Thousands):

- (U) \$1,944 Conducted external aerodynamics and hypersonics basic research for improved flight performance and control of Air Force air vehicle systems.
 - (U) Developed Large Eddy Simulation (LES) methodology to predict three-dimensional flow fields. New methodology will decrease the design cycle time for new aerospace vehicle configurations.
 - (U) Derived hypersonic flow computational modeling techniques. These improved techniques will result in lower weight, less complex hypersonic vehicle configurations, at reduced cost.
- (U) \$4,036 Performed turbulence and flow control research to enhance air vehicle stability, performance, and control.
 - (U) Investigated micro-flow control to reduce air vehicle drag and increase air vehicle lift. Research will increase air vehicle range and maneuverability.
 - (U) Developed structure-based turbulence model for accurate flow field predictions: model will dramatically reduce the design cycle time and improve the accuracy of new computational design methodologies.
- (U) \$2,473 Conducted internal flow research to improve the performance and reliability/maintainability of airbreathing propulsion systems.
 - (U) Investigated the active stabilization of engine surge: research will provide methods to prevent destructive engine failures in flight.
 - (U) Examined the effect of shocks/turbulence on film cooling turbine blades: research will result in longer turbine blade life, significantly reducing turbine blade life cycle costs.
- (U) \$8,453 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences PROJECT 2307	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$2,662	Conduct external aerodynamics and hypersonics basic research for improved flight performance and control of Air Force air vehicle systems.	
	– (U) Investigate fluid/structure interaction flow fields for optimized vehicle designs to reduce large vehicle weight. This research will also enhance the reliability and maintainability (R&M) of currently operating air vehicle systems.	
	– (U) Develop experiments for hypersonic model and theory development. These experiments validate the modeling efforts underway and allow design of lighter weight, less complex hypersonic vehicles.	
– (U) \$5,525	Perform turbulence and flow control research to enhance air vehicle stability, performance, and control.	
	– (U) Develop active flow-control strategies for flow reattachment in separated flow regions. These strategies will increase lift and reduce drag to increase vehicle range performance.	
	– (U) Explore low-dimensional computational models for turbulent boundary layer control. These models will be used in an active flow control scheme to reduce air vehicle drag, thus increasing range for greater mobility.	
– (U) \$3,386	Conduct internal flow research to improve the performance and reliability/maintainability of airbreathing propulsion systems.	
	– (U) Explore use of micro-electrical mechanical system (MEMS) devices for turbine engine control. These devices would be used to reduce or eliminate High Cycle Fatigue (HCF) problems in current airbreathing propulsion systems.	
	– (U) Validate use of Large Eddy Simulation (LES) methodologies for turbomachinery flows. This research will decrease the design cycle time for new airbreathing propulsion systems.	
– (U) \$11,573	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$1,630	Conduct external aerodynamics and hypersonics basic research for improved flight performance and control of Air Force air vehicle systems.	
	– (U) Develop fluid/structural interaction models based on flow field interaction research. Use of models in the design phase of new air vehicles will eliminate fatigue caused by unsteady structural loading. This research will reduce life cycle costs of new air vehicle systems.	
	– (U) Investigate novel concepts for hypersonic flow control. This research will reduce the size and weight/cost of new hypersonic air vehicles, thus allowing for increased global mobility.	
– (U) \$3,461	Perform turbulence and flow control research to enhance air vehicle stability, performance, and control.	
	– (U) Investigate the use of MEMS devices on swept wing air vehicles. This research will allow for significant drag reduction at supersonic speeds resulting in increased vehicle range performance.	
	– (U) Develop MEMS actuators and sensors for micro-air vehicle systems. This research will allow micro-air vehicles and propulsion systems to operate in low-speed flight regimes.	
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2307															
<ul style="list-style-type: none"> – (U) \$2,121 Conduct internal flow research to improve the performance and reliability/maintainability of airbreathing propulsion systems. <ul style="list-style-type: none"> – (U) Develop MicroElectroMechanical Systems (MEMS) devices for turbine engine control. These devices will reduce and/or eliminate High Cycle Fatigue (HCF) problems in current airbreathing propulsion systems. – (U) Develop Large Eddy Simulation (LES) methodology for turbomachinery flows. This research will decrease the design cycle time for new airbreathing propulsion systems. – (U) \$7,212 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1997</th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1998</th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1999</th> <th style="text-align: center; border-bottom: 1px solid black;">Total Cost</th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">11,107</td> <td style="text-align: center;">13,294</td> <td style="text-align: center;">13,489</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">8,453</td> <td style="text-align: center;">11,573</td> <td style="text-align: center;">7,212</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p style="padding-left: 20px;">Schedule: Not Applicable.</p> <p style="padding-left: 20px;">Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> – (U) PE 0602102F, Materials. – (U) PE 0602201F, Aerospace Flight Dynamics. – (U) PE 0602203F, Aerospace Propulsion. – (U) PE 0603211F, Aerospace Structures. 				FY 1997	FY 1998	FY 1999	Total Cost	(U) Previous President's Budget (FY 1998 PB)	11,107	13,294	13,489	Cont	(U) Current Budget Submit/FY 1999 PB	8,453	11,573	7,212	Cont
	FY 1997	FY 1998	FY 1999	Total Cost													
(U) Previous President's Budget (FY 1998 PB)	11,107	13,294	13,489	Cont													
(U) Current Budget Submit/FY 1999 PB	8,453	11,573	7,212	Cont													
Project 2307	Page 23 of 42 Pages	Exhibit R-2 (PE 0601102F)															

DATE **February 1998**

BUDGET ACTIVITY
1 - Basic Research

PE NUMBER AND TITLE
0601102F Defense Research Sciences

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 1 - Basic Research			PE NUMBER AND TITLE 0601102F Defense Research Sciences					PROJECT 2308			
COST (\$ In Thousands)			FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2308	Propulsion		10,075	9,830	18,675	19,524	19,765	20,078	20,470	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Efforts include space power and propulsion, airbreathing propulsion, and propulsion diagnostics. Research is focused on the efficient utilization of energy in airbreathing engines and chemical and non-chemical rockets. Research is organized into the areas of chemically reacting flow, non-chemical energetics. Chemically reacting flows involve complex coupling between energy release through chemical reaction and the flow processes which transport chemical reactants, products, and energy. Non-chemical energetic systems include plasma and beamed energy propulsion for orbit raising space missions and efficient ultra-high energy techniques for space-based energy utilization. Thermal management of space-based power and propulsion systems will be addressed.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,060 Performed research on space and rocket propulsion and power. <ul style="list-style-type: none"> - (U) Studied combustion instability in liquid-fueled rockets to achieve Integrated High Payoff Rocket Propulsion Technology (IHRPT) program goals. - (U) Performed experimental and numerical investigation of plasma thrusters for orbit maneuvering and station keeping. Plasma thrusters provide high payload, affordable, and reliable propulsion alternatives for space operations. - (U) Constructed a database of high-altitude rocket exhaust plume characteristics through experimental and numerical investigations. Database will enhance guidance algorithms and background scene generation for protection of space assets and capabilities. - (U) \$5,355 Studied airbreathing combustion for propulsion systems including gas turbines for aircraft and scramjets for hypersonic flight capability. <ul style="list-style-type: none"> - (U) Examined combustion product formation to minimize infrared signature in gas turbine engines and to comply with environmental regulation. - (U) Investigated hydrocarbon fuel utilization in scramjets as a logistically supportable alternative to hydrogen fuel. - (U) \$660 Investigated propulsion diagnostics for research, development, test, and evaluation of new propulsion system concepts. <ul style="list-style-type: none"> - (U) Utilized planar laser-induced fluorescence to conduct time-resolved, multidimensional, multiparameter measurements to characterize fuel-air mixing and combustion efficiency in gas turbines and hypersonic propulsion systems. - (U) Examined quantitative spectroscopic measurements in elevated pressures. Anticipates advanced gas turbine designs (Integrated High Performance Turbine Engine Technology (IHPTET) Phase III and beyond). - (U) \$10,075 Total 											
Project 2308			Page 24 of 42 Pages				Exhibit R-2 (PE 0601102F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences PROJECT 2308	
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,932 Perform research on space and rocket propulsion and power. <ul style="list-style-type: none"> - (U) Examine rocket combustion instability to achieve third phase Integrated High Payoff Rocket Propulsion Technology (IHPRPT) program goals. - (U) Investigate orbital station-keeping propulsion alternatives at micro- and nano- newtons thrust level for high-precision clusters of cooperating autonomous mini-satellite operations. - (U) Experimentally and numerically investigate high-altitude rocket exhaust plume characterization to enhance database for guidance algorithms and background scene generation. - (U) \$5,376 Study airbreathing combustion for propulsion systems including gas turbines for aircraft and scramjets for hypersonic flight capability. <ul style="list-style-type: none"> - (U) Examine combustion product formation in gas turbine engines and explore supercritical fuel behavior under high temperature and pressure conditions, characteristic of future gas turbine engines and hypersonic propulsion systems. - (U) Formulate new models for turbulence-chemistry interactions in combustion. Models are needed in computational algorithms for combustor design, such as the NASA National Combustor Design Code. - (U) \$522 Investigate propulsion diagnostics for research, development, test, and evaluation of new propulsion system concepts. <ul style="list-style-type: none"> - (U) Investigate high-speed image detection methods for propulsion system diagnostics such as planar laser-induced fluorescence. - (U) Examine picosecond spectroscopic methods for measurements in high-pressure gas turbine combustors. - (U) \$9,830 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,520 Perform research on space and rocket propulsion and power. <ul style="list-style-type: none"> - (U) Model predictions of mini-satellite propulsion and performance for high-precision clusters of cooperating autonomous micro-satellite operations. - (U) Develop supercritical combustion models for rocket propulsion to achieve next-generation, high thrust-to-weight ratio propulsion systems. - (U) Perform experimental and numerical studies of high altitude ultraviolet (UV) and infrared (IR) signatures to protect space assets. - (U) \$10,140 Study airbreathing combustion for propulsion systems including gas turbines for aircraft and scramjets for hypersonic flight capability. <ul style="list-style-type: none"> - (U) Investigate the combustion chemistry of endothermic fuels to be used for thermal management in later phases of Integrated High Performance Turbine Engine Technology (IHPTET) gas turbine technology and in scramjets, leading to more efficient engines. - (U) Study the coupling mechanisms between turbulence and liquid hydrocarbon fuel injection in gas turbine and scramjet engines to achieve enhanced fuel-air mixing and combustion efficiency. 		
Project 2308	Page 25 of 42 Pages	Exhibit R-2 (PE 0601102F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2308															
<ul style="list-style-type: none"> – (U) \$1,015 Investigate propulsion diagnostics for research, development, test, and evaluation of new propulsion system concepts. <ul style="list-style-type: none"> – (U) Research novel data reduction and interpretation approaches such as fractal analysis for quantitative image measurements in propulsion system environments. – (U) Extend diode-laser spectroscopic technique for onboard control of propulsion system operation and performance. – (U) \$18,675 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">10,686</td> <td style="text-align: center;">11,293</td> <td style="text-align: center;">11,359</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">10,075</td> <td style="text-align: center;">9,830</td> <td style="text-align: center;">18,675</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to increased emphasis on propulsion efforts within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> – (U) PE 0602102F, Materials. – (U) PE 0602203F, Aerospace Propulsion. – (U) PE 0602601F, Phillips Laboratory. – (U) PE 0603211F, Aerospace Structures. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY 1998 PB)	10,686	11,293	11,359	Cont	(U) Current Budget Submit/FY 1999 PB	10,075	9,830	18,675	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>													
(U) Previous President's Budget (FY 1998 PB)	10,686	11,293	11,359	Cont													
(U) Current Budget Submit/FY 1999 PB	10,075	9,830	18,675	Cont													
Project 2308	<i>Page 26 of 42 Pages</i>	Exhibit R-2 (PE 0601102F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2310
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2310 Atmospheric Sciences	7,239	6,244	5,562	5,802	5,868	5,958	6,075	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Areas of emphasis include ionospheric research and meteorology. This research includes the physics, dynamics, and chemistry of processes that determine the structure and variability of the earth's atmosphere. Atmospheric properties such as wind, density, clouds and precipitation, ionization, and optical/infrared (IR) transmission/emissivity all affect the performance of Air Force systems. Research includes new measurement techniques and the development of models for specifying and predicting weather and other atmospheric conditions. Emphasis is placed on understanding fundamental atmospheric processes and their impacts on optical and IR weapon systems, and on understanding the dynamics and structure of the ionosphere that affect communications and surveillance systems. Major research efforts focus on ionospheric dynamics, mesoscale meteorology, triggered and natural lightning, cloud prediction, and models which define the optical structure of the atmosphere.

(U) FY 1997 (\$ in Thousands):

- (U) \$3,025 Conducted research on atmospheric modeling to enhance operational forecast capability.
 - (U) Enhanced theoretical models of ionospheric dynamics describing processes that determine total electron concentration. Models will heighten forecast accuracy, minimizing disruptions to global radio communications and space surveillance.
 - (U) Improved four-dimensional data assimilation techniques for integrating multispectral satellite data required for periodic updating of atmospheric models. These techniques facilitate highly accurate forecasts for aviation weather, which in turn limit adverse effects on precision-guided munitions (PGM) employment, and help identify optimum surveillance opportunities.
- (U) \$1,502 Analyzed atmospheric physics to understand and exploit the aerospace environment.
 - (U) Profoundly improved techniques for remote sensing of the three-dimensional structure of cloud fields. Enables state-of-the-art prediction systems to determine precise weather limitations for surveillance and PGM employment.
 - (U) Developed methodologies for WSR-88D Doppler radar which improve identification of turbulence, severe weather, and signal ambiguities, thus enhancing aviation safety and hazard avoidance.
- (U) \$2,712 Studied ionospheric physics to enhance global surveillance capability.
 - (U) Examined natural and artificially-induced ducting phenomena in the equatorial ionosphere for increased understanding of their effects on global radio communications and space surveillance.
 - (U) Investigated applications of Defense Meteorological Satellite Program (DMSP) observations to forecast equatorial spread-F (equatorial plasma depletion) events. Accurate prediction will reduce disruption of global radio communications and space surveillance.
- (U) \$7,239 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	
		PROJECT 2310
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$1,918	Conduct research on atmospheric modeling to enhance operational forecast capability. – (U) Identify crucial propagation modes through radio wave - space plasma interaction models. Enables diagnosis of ionospheric variability and minimizes disruptions to global communications and space surveillance. – (U) Model the structure of Kelvin-Helmholtz instabilities in stratified environments to show their effect on optical turbulence and propagation of laser radiation from airborne lasers.	
– (U) \$1,309	Analyze atmospheric physics to understand and exploit the aerospace environment. – (U) Explore atmospheric electrification processes, focusing on hazards to space launch operations and optical characteristics of high altitude electric discharges, which affect global command and control capability and global radio communications and space surveillance. – (U) Improve satellite-based remote sensing of clouds, winds, visibility, relative humidity, and refractive index for airborne laser tactical use.	
– (U) \$3,017	Study ionospheric physics to enhance global surveillance capability. – (U) Expand knowledge of gravity wave phenomena and density variations in the ionosphere and mesosphere, to improve forecasts of adverse effects on global radio communications and space surveillance. – (U) Enhance capability to observe and diagnose the ionosphere with portable radars and optical instrumentation, to limit disruption of global radio communications and space surveillance.	
– (U) \$6,244	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$1,678	Conduct research on atmospheric modeling to enhance operational forecast capability. – (U) Enhance modeling and data analysis to couple ionospheric behavior with the neutral lower atmosphere and magnetospheric plasma. Superior models will significantly increase ability to forecast advance effects on global radio communications and space surveillance. – (U) Improve atmospheric radiative transfer models to more realistically estimate solar radiation impacts on cloud field dynamics to identify weather limitations on global surveillance and precision-guided munitions (PGM) employment.	
– (U) \$263	Analyze atmospheric physics to understand and exploit the aerospace environment. – (U) Develop techniques using inverted Global Positioning System (GPS) data to determine vertical profiles of refractive index. Provides tactical decision aids to PGMs and the airborne lasers. – (U) Investigate gravity wave interaction with ambient atmospheric vorticity fields, producing “blini” (pancake) structures and optical turbulence, which degrade the propagation of laser radiation from airborne lasers.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2310															
<p>– (U) \$3,621 Study ionospheric physics to enhance global surveillance capability.</p> <p style="margin-left: 40px;">– (U) Investigate ionosphere manipulation techniques using “heating radars” to artificially modify radio wave propagation for global radio communications and space surveillance.</p> <p style="margin-left: 40px;">– (U) Examine signatures of solar activity on ionospheric optical emissions, density variations, E-region dynamo currents, and ionization rates, which disrupt global radio communications and space surveillance.</p> <p>– (U) \$5,562 Total</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President’s Budget (FY 1998 PB)</td> <td style="text-align: center;">7,247</td> <td style="text-align: center;">7,172</td> <td style="text-align: center;">7,381</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">7,239</td> <td style="text-align: center;">6,244</td> <td style="text-align: center;">5,562</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="margin-left: 20px;">Funding: Changes to this project since the previous President’s Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p style="margin-left: 20px;">Schedule: Not Applicable.</p> <p style="margin-left: 20px;">Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> – (U) PE 0305160F, Defense Meteorological Satellite Program. – (U) PE 0602601F, Phillips Laboratory. – (U) PE 0603220C, Surveillance, Acquisition, Tracking, and Kill. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President’s Budget (FY 1998 PB)	7,247	7,172	7,381	Cont	(U) Current Budget Submit/FY 1999 PB	7,239	6,244	5,562	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>													
(U) Previous President’s Budget (FY 1998 PB)	7,247	7,172	7,381	Cont													
(U) Current Budget Submit/FY 1999 PB	7,239	6,244	5,562	Cont													
Project 2310	Page 29 of 42 Pages	Exhibit R-2 (PE 0601102F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2311
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2311 Space Sciences	4,628	4,320	6,827	7,127	7,211	7,321	7,464	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification:** The objective of this project is to provide basic knowledge of the space environment and solar activity for the design and calibration of advanced Air Force systems relevant to operations in and through near-earth space. The project also supports the Air Weather Service (AWS) by improving observing and forecasting techniques that support operational military systems in space environments. Theoretical and empirical descriptions and models of the physics of the sun and the earth's magnetosphere, which are critical elements of future AWS prediction models and radiation belt codes, are being investigated.

(U) FY 1997 (\$ in Thousands):

- (U) \$1,445 Analyzed physics of solar magnetic fields, solar flares and coronal mass ejections to provide a physical basis for predictive models of solar disturbance effects on near-earth space.
 - (U) Designed, constructed, and field-tested a spectrally tunable, near-infrared vector magnetograph to seek signatures of solar activity precursors. Ability to predict such occurrences yields advance notice to protect DoD space systems.
 - (U) Discovered presence of surface motion and strong vorticity signatures in solar active regions.
- (U) \$1,426 Studied particle and interplanetary magnetic field properties of solar wind which transports solar disturbances to the earth's magnetosphere.
 - (U) Developed integrated circuit model to predict substorms in the magnetosphere when the interplanetary magnetic field has a southward polarity. Model will reduce calculation time for the Air Force specification and forecast model.
 - (U) Formulated theoretical model to predict creation of transpolar auroral arcs during periods of northward interplanetary magnetic field. Theoretical model will be used to evaluate performance of the Air Force specification and forecast model during times of changing interplanetary conditions.
- (U) \$1,757 Performed study of magnetospheric and radiation belt processes to eliminate operational deficiencies caused by space weather effects.
 - (U) Developed a new model of inner magnetospheric electric fields to specify and forecast hazards to Air Force space systems.
 - (U) Analyzed satellite measurements to specify correlations between changes in convection patterns and the polarity of the interplanetary magnetic field. Analysis will enhance performance of Air Force communication systems at high latitudes.
- (U) \$4,628 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2311
(U) <u>FY 1998 (\$ in Thousands):</u>		
- (U) \$1,273	Analyze physics of solar magnetic fields, solar flares and coronal mass ejections to provide a physical basis for predictive models of solar disturbances on near-earth space.	
	- (U) Measure and quantify the time dependence of solar magnetic fields to determine topologies leading to solar flares and coronal mass ejections which can disrupt the earth's space environment.	
	- (U) Study the propagation and structure of coronal mass ejections in relation to the solar magnetic sector structure.	
- (U) \$1,741	Study magnetospheric and radiation belt processes to eliminate operational deficiencies caused by space weather effects.	
	- (U) Examine the response of energetic particles in the inner magnetosphere to high-speed solar wind streams.	
	- (U) Investigate the propagation of electrons injected into the magnetosphere by space-based platforms.	
- (U) \$1,306	Study the particle and interplanetary magnetic field properties of the solar wind which transports solar disturbances to the earth's magnetosphere.	
	- (U) Analyze and model the propagation of solar wind shock waves from a solar-wind sensor in space.	
	- (U) Study the coupling between the solar wind interplanetary magnetic field and the earth's magnetosphere by using solar-wind and near-earth satellites to analyze the solar wind ions that penetrate the magnetosphere.	
- (U) \$4,320	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
- (U) \$1,815	Analyze the physics of solar magnetic fields, solar flares and coronal mass ejections to provide a physical basis for predictive models of the solar disturbances on near-earth space.	
	- (U) Model the evolution and stability of solar active regions to predict the state of the interplanetary medium using solar magnetic field and coronal data.	
	- (U) Analyze coronal emission line data for variations that can be related to disturbances in the interplanetary medium.	
- (U) \$2,167	Study the particle and interplanetary magnetic field properties of the solar wind which transports solar disturbances to the earth's magnetosphere.	
	- (U) Evaluate techniques to study solar source regions and infer the magnetic structures of interplanetary disturbances.	
	- (U) Test solar wind shock detection algorithms and transition them to applied Air Force geospace programs.	
- (U) \$2,845	Study magnetospheric and radiation belt processes to eliminate operational deficiencies caused by space weather effects.	
	- (U) Study fluid and particle dynamics of the geomagnetic tail to determine criteria for substorm onset.	
	- (U) Model rapid variations in the interaction between the solar wind and magnetosphere using diffusion coefficients estimated from electric field propagation studies.	
- (U) \$6,827	Total	
Project 2311	Page 31 of 42 Pages	Exhibit R-2 (PE 0601102F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2311
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	5,229	4,962	5,040	Cont
(U) Current Budget Submit/FY 1999 PB	4,628	4,320	6,827	Cont

(U) **Change Summary Explanation:**

Funding: Changes to this project since the previous President's Budget are due to increased emphasis on space sciences efforts within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0302101F, Geophysics.
- (U) PE 0602702F, Command, Control, and Communications.
- (U) PE 0603410F, Space System Environmental Interactions.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2312
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2312 Biological Sciences	12,241	13,917	13,065	13,654	13,821	14,036	14,312	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project consists of two research areas: biodegradation and the toxicology of biohazards; and chronobiology and neural adaptation. Understanding how microbes degrade Air Force chemicals will enable the development of efficient and cost-effective strategies for cleaning up Air Force bases and preventing exposure to hazards due to Air Force operations. Likewise, knowledge of the mechanisms by which Air Force chemical and physical (lasers and microwaves) agents produce toxic effects will enable the development of safety assessment strategies and technologies to ensure the hazard-free development and use of future aerospace materials and systems. Basic research in neuroscience and chronobiology will result in new strategies to prevent G-induced loss of consciousness in pilots, impaired performance due to jet-lag and shift-work, night operations, and the loss of life and aircraft due to stress, inattention, or lack of vigilance.

(U) FY 1997 (\$ in Thousands):

- (U) \$796 Performed generic basic research in biological sciences for Air Force applications.
- (U) \$6,059 Studied biodegradation and toxicology of biohazardous agents.
 - (U) Cloned genes that encode for the microbial enzymatic degradation of tri-nitro-toluene (TNT) for eventual use in cleaning up military bases.
 - (U) Recommended national safety standards for protecting the eye from exposure to single ultrashort laser pulses.
 - (U) Described cellular and biochemical effects of a natural neuropeptide (substance P) in protecting immune system from inhalation exposure to JP-8 jet fuel.
- (U) \$5,386 Investigated mechanisms responsible for circadian rhythmicity to increase safety during night operation.
 - (U) Determined that exercise shifts the biological clock, therefore, appropriately timed exercise will partially compensate for jet lag.
 - (U) Clarified interaction between serotonin and light input to biological clock.
- (U) \$12,241 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	
		PROJECT 2312
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$6,950	Study biodegradation and toxicology of biohazardous agents. – (U) Explore molecular biological mechanisms for expanding and controlling the genetic capacity of microbes to enzymatically degrade a wider range of military contaminants.	
	– (U) Examine the biological effects from exposure to multiple ultrashort laser pulses and radiofrequency.	
	– (U) Investigate toxic and protective mechanisms related to JP-8 jet fuel exposures.	
– (U) \$5,558	Investigate biological mechanisms responsible for circadian rhythmicity.	
	– (U) Investigate chemistry of circadian clock to develop procedures and interventions to improve performance during night operations.	
	– (U) Explore circadian system plasticity to identify methods of jet lag prevention and reduction.	
– (U) \$1,409	Conduct research on animal sensing systems.	
	– (U) Study natural-world infrared-sensitive systems for insights leading to military applications including space sensors.	
– (U) \$13,917	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$5,571	Study biodegradation and toxicology of biohazardous agents. – (U) Use molecular biological techniques developed for modifying microbial enzyme capacity to engineer the bio-catalysis of reactions involved in the synthesis and manufacture of developmental military materials.	
	– (U) Develop mathematical model to predict retinal damage from exposure to multiple ultrashort laser pulses of military importance.	
	– (U) Investigate molecular and biochemical effects in the brain and the neurobehavioral correlates associated with the inhalation of JP-8 jet fuel.	
– (U) \$6,048	Investigate biological mechanisms responsible for circadian rhythmicity.	
	– (U) Examine individual differences in circadian systems to predict effects of night operations and jet lag on military personnel.	
– (U) \$1,446	Continue research in mechanisms of animal sensing systems.	
	– (U) Investigate insect infrared systems for insights leading to military applications including space sensors.	
– (U) \$13,065	Total	
Project 2312	Page 34 of 42 Pages	Exhibit R-2 (PE 0601102F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2312															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">15,391</td> <td style="text-align: center;">15,986</td> <td style="text-align: center;">16,119</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">12,241</td> <td style="text-align: center;">13,917</td> <td style="text-align: center;">13,065</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u> - (U) PE 0602202F, Human Systems Technology.</p> <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	15,391	15,986	16,119	Cont	(U) Current Budget Submit/FY 1999 PB	12,241	13,917	13,065	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>													
(U) Previous President's Budget (FY 1998 PB)	15,391	15,986	16,119	Cont													
(U) Current Budget Submit/FY 1999 PB	12,241	13,917	13,065	Cont													
Project 2312	<i>Page 35 of 42 Pages</i>	Exhibit R-2 (PE 0601102F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2313
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2313 Human Performance	8,729	7,877	12,567	13,133	13,292	13,500	13,764	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project provides fundamental knowledge of information processing in humans and other complex organisms needed to advance technologies for autonomous systems, command and control, human systems integration, and personnel selection and training. Research on sensory systems impacts technologies of computer image and speech processing, human interface, sensors and sensor fusion. Research on cognitive and perceptual processes impacts technologies of selection, education and training, command and control, and adaptive autonomous systems. Supported areas of research include Sensory Systems, with emphasis on vision and hearing, Cognition, Perception, Intelligent Tutors, and Team Situational Awareness.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,416 Performed sensory and perceptual system analysis for human machine interface and image exploitation.
 - (U) Discovered new technique for fusing multi-spectral images for visual display.
 - (U) Devised new algorithm for computing scene depth from active focus control. Applications include robotics, surveillance, and targeting.
 - (U) Established new, image processing filters based on human-image processing. Enhances image compression in communications and image segmentation in automatic target recognition.
 - (U) Completed laboratory demonstration of performance enhancement aided by three-dimensional auditory cueing. Improves active visual search in aircraft and improves speech communication in command and control.
- (U) \$3,478 Conducted cognitive workload analysis for crew training and performance enhancement.
 - (U) Completed preliminary cognitive task analyses for uninhabited air vehicle (UAV) mission control and command and control team research environments.
 - (U) Determined benchmark task sets for mission control and command and control teams.
 - (U) Created new software tool for faster, more formal, cognitive task analyses.
 - (U) Discovered objective technique for cognitive workload assessment in human machine interface and training.
- (U) \$2,835 Studied synthetic task environments for baseline performance measurement.
 - (U) Created apparatus for laboratory performance assessment of UAV mission control.
 - (U) Established synthetic task environment for laboratory performance assessment of command and control teams.
 - (U) Completed initial configuration of multi-ship flight simulator for performance and training assessment.
- (U) \$8,729 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences PROJECT 2313	
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<p>– (U) \$2,101</p>	<p>Perform sensory and perceptual system analysis for human-machine interface and image exploitation.</p>	
	<p>– (U) Examine human ability to detect and discriminate structure in complex images. Enhances image exploitation and targeting technologies.</p>	
	<p>– (U) Study human perception of false coloration in multi-spectral image displays. Improves interfaces for multi-spectral image acquisition systems.</p>	
	<p>– (U) Explore human ability to localize sounds in the near field, to improve communications in command and control.</p>	
<p>– (U) \$3,025</p>	<p>Conduct cognitive workload analysis for crew training and performance enhancement.</p>	
	<p>– (U) Develop models and improve theory of individual cognitive performance in decision making. Enhances technologies for high-tempo operations.</p>	
	<p>– (U) Develop models to predict impact of intelligent job-aiding technologies on overall performance of command and control teams.</p>	
	<p>– (U) Create framework and experimental techniques for titrating multiple effects of ability, training, interface, and environment on workload in complex settings.</p>	
<p>– (U) \$2,751</p>	<p>Study synthetic task environments for baseline performance measurement.</p>	
	<p>– (U) Establish quantitative models of cognitive performance in scripted uninhabited air vehicle (UAV) mission control tasks.</p>	
	<p>– (U) Determine sensitivity of command and control teams to increased task demands, mitigated by job aiding and other performance enhancement technologies.</p>	
	<p>– (U) Establish performance criteria for multi-ship simulation environments.</p>	
<p>– (U) \$7,877</p>	<p>Total</p>	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p>		
<p>– (U) \$3,460</p>	<p>Perform sensory and perceptual system analysis for human-machine interface and image exploitation.</p>	
	<p>– (U) Develop image representation theory using cues of color, motion, texture, and stereo for improved image display and human image exploitation technologies.</p>	
	<p>– (U) Investigate algorithms for visual attention that incorporate eye movement patterns. Improves performance assessment in command and control environments.</p>	
	<p>– (U) Support model-based predictions of limits in speech communication to improve three-dimensional audio display technologies.</p>	
<p>Project 2313</p>	<p align="center"><i>Page 37 of 42 Pages</i></p>	<p align="right">Exhibit R-2 (PE 0601102F)</p>

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences PROJECT 2313	
<ul style="list-style-type: none"> - (U) \$4,980 	<ul style="list-style-type: none"> Conduct cognitive workload analysis for crew training and performance enhancement. <ul style="list-style-type: none"> - (U) Examine cognitive performance models for real-time workload measurement to improve technologies employed in the training and the amelioration of cognitive overload -- key elements of command and control environments. - (U) Develop theory of cognitive workload including multiple dimensions that affect individual workload. Enhances modeling and simulation technologies. - (U) Extend cognitive models to include characterization of on-line job aiding systems used in synthetic, laboratory, command and control environments. 	
<ul style="list-style-type: none"> - (U) \$4,127 	<ul style="list-style-type: none"> Study synthetic task environments for baseline performance measurement. <ul style="list-style-type: none"> - (U) Conduct experiments leading to more general theory of utility for performance enhancement techniques, as anticipated for uninhabited air vehicle (UAV) mission control. - (U) Extend experimental techniques for command and control team performance, including constellations of small teams. - (U) Develop multi-ship modeling for UAV surveillance and targeting. 	
<ul style="list-style-type: none"> - (U) \$12,567 	<ul style="list-style-type: none"> Total 	

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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 2313
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	8,738	9,057	9,190	Cont
(U) Current Budget Submit/FY 1999 PB	8,729	7,877	12,567	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to increased emphasis on human performance efforts within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602202F, Human Systems Technology.
- (U) PE 0602702F, Command, Control, and Communication.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	PROJECT 4113
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4113 Science and Engineering Education Programs	12,800	15,102	13,285	13,902	14,079	14,305	14,586	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project stimulates scientific and engineering education and increases the interaction between the broader research community (including the international research community) and the Air Force laboratories. Emphasis is placed on increasing the number of U.S. citizens, especially women and minorities, with advanced degrees in science and engineering. These programs include: the Summer Faculty Research Program under which selected university faculty members conduct research at Air Force labs; the Graduate Student Research Program where graduate students in areas of interest to the Air Force perform research at Air Force labs; the University Resident Research Program where faculty members spend one year at an Air Force lab contributing to Air Force research needs and operations; the U.S. Air Force National Research Council (NRC) Resident Research Associateship Program which provides outstanding post-doctoral and senior scientists and engineers opportunities to research problems of their own choice that are compatible with the research interests of selected Air Force labs; the Laboratory Graduate Fellowship Program which is designed to stimulate doctoral candidate interest in Air Force labs and the research programs of those labs; and the National Defense Science and Engineering Graduate Fellowship Program which is jointly sponsored by the Army, Navy, Air Force, the Defense Advanced Research Projects Agency for the purpose of increasing the number of U.S. citizens trained in science and engineering, and various international programs such as Windows on Science which provides insight and experience in international research.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,816 Funded international science and personnel exchange programs and technology liaison mission in Europe and Asia.
 - (U) Supported nine Air Force scientists and engineers in European government laboratories, under the Engineer and Scientist Exchange Program (ESEP) program. Participants gain valuable experience performing research with foreign counterparts.
 - (U) Provided the Air Force share of funding for the Von Karmen Research Institute, which researches technologies of special NATO concern.
 - (U) Provided funding for the European Office of Aerospace Research and Development (EOARD) office in London and the Asian Office of Aerospace Research and Development (AOARD) office in Tokyo to perform technology liaison missions as well as to establish contact with foreign centers specializing in emerging technologies of critical Air Force interest.
- (U) \$7,424 Supported science and technology personnel exchange within the United States.
 - (U) Funded 189 faculty and 97 students for 12 weeks of research at Air Force labs, focusing on critical Air Force technology areas.
 - (U) Supported the University Residence Research Program by funding sabbaticals at Air Force labs for 29 university researchers.
 - (U) Provided funding for short-term appointments of Air Force Research Laboratory researchers to commercial and university laboratories. Participants gain valuable experience with industry and academic counterparts doing research in Air Force-related technologies.

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BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences PROJECT 4113	
– (U) \$2,560	Conducted fellowship awards program and roundtable on national science and technology policy. – (U) Supported a roundtable of senior leaders from industry, government, and academia to formulate a national science and technology policy. – (U) Provided awards to 50 outstanding university research scientists to pursue critical research at selected Air Force Research Laboratory (AFRL) locations.	
– (U) \$12,800	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$4,983	Fund international science and personnel exchange programs and technology liaison mission in Europe and Asia. – (U) Support scientists and engineers performing laboratory research in foreign countries. – (U) Provide Air Force share of funding for NATO-affiliated research institute. – (U) Fund European Office of Aerospace Research and Development (EOARD) and Asian Office of Aerospace Research and Development (AOARD) detachments to provide technology liaisons with Europe and Asia.	
– (U) \$5,923	Support science and technology personnel exchange within the United States. – (U) Support the summer faculty and graduate student research programs. – (U) Provide funding for university researchers on sabbatical at Air Force labs.	
– (U) \$4,196	Conduct fellowship awards program and roundtable on national science and technology policy. – (U) Support roundtable of senior leaders from industry, government, and academia to formulate a national science and technology policy. – (U) Provide funding for outstanding university research scientists to pursue research in selected areas at appropriate AFRL laboratories.	
– (U) \$15,102	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$4,384	Fund international science and personnel exchange programs and technology liaison mission in Europe and Asia. – (U) Support scientists and engineers performing laboratory research in foreign countries. – (U) Provide Air Force share of funding for NATO-affiliated research institute. – (U) Fund EOARD and AOARD detachments to provide technology liaisons with Europe and Asia.	
– (U) \$5,210	Support science and technology personnel exchange within the United States. – (U) Support the summer faculty and graduate student research programs. – (U) Provide funding for university researchers on sabbatical at Air Force labs.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 1 - Basic Research	PE NUMBER AND TITLE 0601102F Defense Research Sciences	
	PROJECT 4113	
<ul style="list-style-type: none"> <li style="margin-left: 40px;">– (U) Send AFRL researchers on short-term exchange programs to industry and academia. <li style="margin-left: 20px;">– (U) \$3,691 Conduct fellowship awards program and roundtable on national science and technology policy. <ul style="list-style-type: none"> – (U) Support roundtable of senior leaders from industry, government, and academia to formulate a national science and technology policy. – (U) Provide funding for outstanding university research scientists to pursue research in selected areas at appropriate Air Force Research Laboratory laboratories. – (U) \$13,285 Total 		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>		
	<u>FY 1997</u>	<u>FY 1998</u>
	<u>FY 1999</u>	<u>Total</u>
(U) Previous President's Budget (FY 1998 PB)	15,143	17,347
(U) Current Budget Submit/FY 1999 PB	12,800	15,102
		17,600
		13,285
		Cont
		Cont
(U) Change Summary Explanation:		
Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.		
Schedule: Not Applicable.		
Technical: Not Applicable.		
(U) C. <u>Other Program Funding Summary:</u>		
(U) <u>Related Activities:</u>		
– (U) PE 0601103D, University Research Initiative.		
(U) D. <u>Schedule Profile:</u> Not Applicable.		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	75,448	69,339	62,578	63,927	70,330	69,118	68,270	Continuing	Continuing
4347 Materials for Structures, Propulsion, and Subsystems	48,987	41,959	42,017	45,151	49,581	48,852	47,550	Continuing	Continuing
4348 Materials for Electronics, Optics, and Survivability	12,788	13,323	5,509	3,221	3,824	3,782	3,840	Continuing	Continuing
4349 Materials Technology for Sustainment	13,673	14,057	15,052	15,555	16,925	16,484	16,880	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Applied Research program is the primary source of advanced materials and processes to reduce life cycle costs and improve performance, affordability, supportability, reliability, and survivability of current and future Air Force systems. Structural, propulsion, and sub-systems materials and processes are developed for aircraft, missile, space, satellite, and launch systems applications. Electronic and optical, advanced electromagnetic, and laser protection materials and processes are developed for application in Air Force aircraft, missile, space, and personnel protection systems. Advanced nondestructive materials evaluation methods, materials design data, pollution prevention materials, materials failure analysis, and materials repair methods are developed to improve the sustainment of Air Force systems for the current and future warfighters. Note: In FY 1997, Congress added \$7.5 million and \$1 million for composite materials research and advanced paint systems, respectively. In FY 1998, Congress also added \$2.0 million and \$1.0 million for composite aircraft shelters and inorganic/organic optical limiters, respectively, which explains the perceived decrease in FY 1999. In FYs 1999 and out, additional emphasis has been placed on improved materials, space systems, and aging aircraft. Also, in FY 1999 and emphasis has been reduced in electro-optical materials and processing development for aircraft specific applications.

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials			
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	77,877	70,224	74,503	Cont
(U) Appropriated Value	80,860	73224		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,766	-2,915		
b. SBIR	-1,094	-970		
c. Omnibus/Other Above Threshold Reprogrammings	-2,440			
d. Below Threshold Reprogrammings				
e. Rescissions	-112			
(U) Adjustments to Budget Year Since FY 1998 PB			-11,925	
(U) Current Budget Submit/FY 1999 PB	75,448	69,339	62,578	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to Congressional additions and higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4347
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4347 Materials for Structures, Propulsion, and Subsystems	48,987	41,959	42,017	45,151	49,581	48,852	47,550	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Develops materials technologies for aircraft, spacecraft, and missiles with improved affordability, maintainability, and enhanced performance of current and future Air Force systems. Advanced thermal protection and carbon-carbon (C-C) composites materials are developed that are affordable, lightweight, dimensionally stable, thermally conductive, and/or ablation and erosion resistant to meet the requirements of aircraft, spacecraft, missiles, and ballistic reentry systems. A family of affordable lightweight materials are developed, including metals, metallic and nonmetallic composites, and ceramics which can provide upgraded capability for existing aircraft, spacecraft, missile, and propulsion systems to meet the requirements for new systems beyond the year 2000. Included are turbine engine materials with operating capabilities from 1700°F to 2800°F that will enable engine designs to double the thrust to weight of 1986 engine performance capabilities. Spacecraft material technologies are developed that are lightweight, dimensionally stable, noncontaminating, and resistant to the space environment. Alternative or replacement materials are developed to maintain the performance of aging operational reentry systems. Fluids, lubricants, seals, coatings, and other nonstructural material technologies are developed for the subsystems on aircraft, spacecraft, and missile systems as well as their propulsion systems

(U) FY 1997 (\$ in Thousands):

- (U) \$8,979 Develop C-C and thermal protection material (TPM) technologies to improve operational capability of strategic and tactical systems.
 - (U) Conducted ground test validation of alternate/replacement heatshield and antenna window materials and fabricated flight test articles to maintain the operational Intercontinental Ballistic Missile (ICBM) fleet.
 - (U) Conducted evaluation of operational reentry vehicle heatshields which have been in service.
 - (U) Identified and evaluated a cost reducing one step C-C process for electronic packaging applications in aircraft and spacecraft.
- (U) \$6,941 Develop nonstructural materials (such as fluids, lubricants, seals, greases, and coatings) for improved system performance, reduced toxicity, and reduced life cycle costs.
 - (U) Completed laboratory demonstration of polyalphaolefin (PAO)-based coolant with improved temperature stability and dielectric performance for Air Force airborne radar systems.
 - (U) Identified advanced lubricants and coating system technologies for application in aging aircraft and spacecraft.

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4347
– (U) \$16,544	Develop advanced nonmetallic composite structural materials that are affordable for aircraft applications including lightweight airframes, control surfaces, smart skins, and engine compressor frames and ducts, and for spacecraft applications including lightweight trusses, struts, solar arrays, antenna supports, and space vehicle bus structures.	
	– (U) Published a composite patch design guide focusing on adhesively bonded materials and processing issues for the repair and life extension of aging aircraft.	
	– (U) Demonstrated the viability of high modulus polymeric composites for lightweight spacecraft structural applications.	
	– (U) Developed highly active paint-compatible fluorescent dyes for 3D imaging (NDE) of multiple coating layers and sensor protection.	
– (U) \$8,314	Develop and transition affordable lightweight metals and metal matrix composites, higher-temperature intermetallic alloys, and materials processing technology to enable enhanced performance, lower acquisition costs, and improved reliability of Air Force weapon systems.	
	– (U) Completed material validation of SiC/Ti-6242 titanium metal matrix composite (Ti MMC) material for use in actuator rods for engine thrust vectoring nozzles.	
	– (U) Identified and characterized the application potential of an advanced titanium metal matrix composites (Ti MMC) for use in next-generation gas turbine engines.	
	– (U) Investigated compositional effects on the environmental and creep resistance of niobium and molybdenum intermetallic alloys.	
	– (U) Accomplished scale-up metal processing and ingot melting for isotropic aluminum-lithium.	
	– (U) Identified and evaluated permanent mold thin wall casting processes for turbine engines that can reduce the cost of these composites by 40% of today's cost.	
– (U) \$8,209	Develop ceramic matrix composites, an understanding of material response to service life environments, and characterize materials to enable revolutionary performance improvements in advanced propulsion systems and high temperature airframe structures.	
	– (U) Developed repair materials for low-observable and other ceramic composite structures.	
	– (U) Conducted initial high cycle fatigue (HCF) evaluations of titanium alloy to provide guidance on resolving HCF issues with existing and future Air Force turbine engines.	
– (U) \$48,987	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4347
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,970 Develop Carbon-Carbon (C-C) and thermal protection material (TPM) technologies to improve operational capability of strategic and tactical systems. <ul style="list-style-type: none"> - (U) Develop alternate/replacement nosetip and heatshield materials for ballistic missile flight test evaluation. - (U) Develop Global Positioning System antenna window materials with improved durability for ballistic missile flight test evaluation. - (U) Establish baseline criteria for assessment of the aging affects on materials from operational reentry vehicle heatshields which have been in service. - (U) Develop and test properties of a one step C-C process for aircraft and spacecraft electronic materials packaging applications. - (U) Deliver alternate/replacement heatshield and antenna window materials for flight test. - (U) Identify advanced thermal protection system material needs for future Air Force Transatmospheric Vehicles. - (U) \$6,017 Develop nonstructural materials (such as fluids, lubricants, seals, greases and coatings) for improved system performance, reduced toxicity, and reduced life cycle costs. <ul style="list-style-type: none"> - (U) Identify and evaluate materials for improved aircraft paint systems for reduced maintenance and demonstrate low glint, low-observable coating treatments for Air Force systems. - (U) Evaluate, develop, and provide materials data to transition long life hydraulic fluid seals for aging aircraft systems. - (U) Develop advanced lubricants and coating system technologies for application in spacecraft moving mechanical assemblies. - (U) \$11,427 Develop advanced nonmetallic composite structural materials that are affordable for aircraft applications including lightweight airframes, control surfaces, smart skins, and engine compressor frames and ducts, and for spacecraft applications including lightweight trusses, struts, solar arrays, antenna supports, and space vehicle bus structures. <ul style="list-style-type: none"> - (U) Identify and evaluate processing techniques that will minimize residual stresses in organic matrix composites without adversely affecting mechanical or physical properties. - (U) Develop and demonstrate high modulus/thermally conductive polymeric composites for lightweight spacecraft structural applications. - (U) Develop three-dimensional (3-D) failure criteria for the prediction of the initial failure and progressive damage in bonded and bolted composite joints by coupling nondestructive damage observations with 3-D spline variation stress analysis. - (U) Complete computer computational simulations to guide efforts to prepare new organic polymers for flat panel displays, photovoltaic and sensor technologies. - (U) Evaluate two-dimensional (2D) molecules for power limiting and imaging applications. - (U) Prepare stable n-doped polymers for shielding and charge protection in air and space systems. 		
Project 4347	Page 5 of 18 Pages	Exhibit R-2 (PE 0602102F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4347
<ul style="list-style-type: none"> - (U) \$8,326 - (U) \$8,219 - (U) \$41,959 	<p>Develop and transition affordable lightweight metals and metal matrix composites, higher-temperature intermetallic alloys, and materials processing technology to enable enhanced performance, lower acquisition costs, and improved reliability of Air Force weapon systems.</p> <ul style="list-style-type: none"> - (U) Demonstrate titanium metal matrix composite (Ti MMC) actuator rods for advanced turbine engines. - (U) Demonstrate processing techniques for producing isotropic aluminum lithium (Al-Li) thick plate products from 15,000 pound ingots. Application of this material in space launch vehicles instead of current aluminum alloys is expected to result in a 10-20% weight reduction. - (U) Develop permanent mold thin wall casting processes that can reduce the cost of these high temperature components by 40% of today's cost. - (U) Characterize orthorhombic metal matrix composites (MMCs) and gamma titanium aluminide (TiAl) in preparation for engine testing a bladed ring (bling) containing both materials. - (U) Investigate the effect of processing methods on the properties of niobium and molybdenum intermetallic alloys. - (U) Investigate the shape-making potential of different processes assuming the most creep resistant, oxidation resistant alloys. <p>Develop ceramic matrix composites; develop an understanding of material response to service life environments, and characterize materials to enable revolutionary performance improvements in advanced propulsion systems and high temperature airframe structures.</p> <ul style="list-style-type: none"> - (U) Develop ceramic matrix composite for space applications. - (U) Develop repair materials and techniques for low-observable and other ceramic composite structures. - (U) Continue detailed high cycle fatigue (HCF) evaluations of titanium alloy to provide guidance on resolving HCF issues with existing and future Air Force turbine engines. <p>Total</p>	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$8,296 	<p>Develop Carbon-Carbon (C-C) and thermal protection material (TPM) technologies to improve operational capability of strategic and tactical systems.</p> <ul style="list-style-type: none"> - (U) Demonstrate alternate/replacement heatshield materials ready for ballistic missile flight test evaluation. - (U) Demonstrate reduced processing time and cost of one step or other low-cost C-C process for thermal management applications in aircraft and spacecraft. - (U) Identify and evaluate concepts for replacement/qualification of aging materials for life management and life extension of operational reentry vehicles. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	
– (U) \$6,261	Develop nonstructural materials (such as fluids, lubricants, seals, greases and coatings) for improved system performance and reduced life cycle costs.	
<ul style="list-style-type: none"> – (U) Develop improved durability high temperature (450°F) ester-based gas turbine engine lubricant for application to existing aircraft propulsion systems. – (U) Develop materials and processes to replace electrolytically deposited chromium and cadmium on aircraft bearings and fasteners which will improve friction and wear properties. – (U) Develop space-qualified thermal control coatings to lightweight, durable, long life spacecraft radiators. – (U) Identify a thermoplastic hot melt glue gun approach for conductive gap treatments. – (U) Identify potential candidate corrosion inhibitors for Air Force coating systems. 		
– (U) \$9,515	Develop advanced nonmetallic composite structural materials that are affordable for aircraft applications including lightweight airframes, control surfaces, smart skins, and engine compressor frames and ducts, and for spacecraft applications including lightweight trusses, struts, solar arrays, antenna supports, and space vehicle bus structures.	
<ul style="list-style-type: none"> – (U) Develop processing techniques that will minimize residual stresses in organic matrix composites without adversely affecting mechanical or physical properties. - (U) Demonstrate lightweight deployable composite radiator for spacecraft. - (U) Evaluate polymer processing techniques for composites such as the two-photon curing process as a mode of low energy cure for resins and composites. – (U) Synthesize novel polymer structures for electronic conductivity applications in advanced Air Force systems. - (U) Extend the three-dimensional (3-D) spline variational elastic laminate technology (SVELT) stress model to incorporate the effect of environmental exposure in predicting failure initiation and progressive damage in bonded and bolted composite joints. 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4347
<ul style="list-style-type: none"> - (U) \$9,613 Develop and transition affordable lightweight metals and metal matrix composites, higher-temperature intermetallic alloys, and materials processing technology to enable enhanced performance, lower acquisition costs, and improved reliability of Air Force weapon systems. <ul style="list-style-type: none"> - (U) Transition orthorhombic titanium metal matrix composites (MMCs) and gamma titanium aluminides to propulsion technology demonstrator programs for use in critical compressor rotating hardware. - (U) Develop friction stir welding techniques for joining isotropic aluminum lithium (Al-Li) as might be done in producing large structural components for space launch vehicles. - (U) Demonstrate permanent mold thin wall casting processes for turbine engines that can reduce the cost of titanium components by 40% of today's cost. - (U) Evaluate the feasibility of producing gamma titanium aluminide (TiAl) sheet material with an attractive balance of properties for potential weight savings in future spacecraft hot nozzle structures. - (U) Develop intermetallic alloys with the potential for achieving a +200°F temperature increase over current nickel-base superalloy turbine blade materials. - (U) Develop investment and permanent mold casting methods of an advanced high-strength, high-toughness titanium alloy, Ti-62222, for airframe structures. - (U) \$8,332 Develop ceramic matrix composites; develop an understanding of material response to service life environments, and characterize materials to enable revolutionary performance improvements in advanced propulsion systems and high temperature airframe structures. <ul style="list-style-type: none"> - (U) Demonstrate materials and techniques for repair of low-observable and other ceramic composite structures. - (U) Complete assessment and develop damage tolerant life prediction methods for high cycle fatigue (HCF) design of titanium alloy turbine engine fan and compressor blades which will resolve HCF issues with existing and future engines. - (U) Initiate HCF tests of single crystal superalloys. - (U) Scale-up ceramic matrix composites for space propulsion applications by manufacturing sub-elements. - (U) \$42,017 Total 		

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4347
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	50,600	42,214	45,311	Cont
(U) Current Budget Submit/FY 1999 PB	48,987	41,959	42,017	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) PE 0603211F, Aerospace Systems.
- (U) PE 0603202F, Aeropropulsion Subsystem Integration.
- (U) PE 0603216F, Aeropropulsion and Power Technology.
- (U) DOD Metal Matrix Composite Steering Group.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4348
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4348 Materials for Electronics, Optics, and Survivability	12,788	13,323	5,509	3,221	3,824	3,782	3,840	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Develops materials technologies for space sensor systems, radars and subsystems for aircraft, missile, and space applications. This project also develops new materials for protection of aircrews, sensors, aircraft, and space systems from laser threats. Radar modules, microwave devices, infrared (IR) detectors, and infrared countermeasures are used in target detection, electronic warfare, active aircraft protection, and communications. The performance of these systems is constrained by the quality and physical characteristics of these materials. Materials are developed in this project that enable radars and sensors with higher operating speeds, greater tunability, higher out put power, improved thermal management, (including higher operating temperatures), greater sensitivity, and extended dynamic range. The improved materials also increase production quality , increase yields and reduce costs for radar and sensor systems. Protection from lasers is dependent upon the power level and wavelength or color emanating from the laser device and the susceptibility of the material or system being lased. Additionally, protection schemes are dependent on other characteristics of the laser such as variability of the wavelength and mode of operation (continuous wave or pulsed). Materials are optimized to counter the most prominent threat wavelengths and new materials are developed to respond to emerging threat wavelengths and ultimately to reject laser energy independent of threat wavelengths.

(U) FY 1997 (\$ in Thousands):

- (U) \$7,344 Develop new materials and processes to provide improved operational capability for Air Force radar and space sensor systems
 - (U) Demonstrated the feasibility of a high temperature superconducting (HTS) infrared detector (IR) material that would not require cryogenic cooling for specialized space applications.
 - (U) Demonstrated enhanced operability and resolution of long wavelength Focal Plane Arrays (FPAs) for space imagery and tracking through the development of very low defect, high performance detector materials.
 - (U) Identified improved growth processes for wide-bandgap materials.
- (U) \$4,294 Develop materials to enhance the survivability of aircrews against laser threats and heat seeking IR missiles.
 - (U) Completed laboratory demonstration of first generation, nonlinear organic materials for protection of personnel eyes, viewing systems, and night vision devices.
 - (U) Transitioned ZnGeP2 frequency conversion crystalline materials to Infrared Countermeasures (IRCM) program.
- (U) \$1,150 Develop materials to enhance the survivability of air and space sensor systems against laser threats.
 - (U) Evaluated candidate mid-infrared nonlinear optical materials for switches and limiters for laser protection.
 - (U) Evaluated tunable filter technologies for laser protection devices.
- (U) \$12,788 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials PROJECT 4348	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$5,798	Develop new materials and processes to provide improved operational capability for Air Force radar and space sensor systems	
	– (U) Identify and evaluate optimum crystals and techniques for high-power wavelength conversion of carbon dioxide and other lasers for Infrared Countermeasure (IRCM) and related applications (e.g., remote sensing of chemical and biological agents).	
	– (U) Develop growth processes for wide-bandgap (silicon carbide, SiC) semiconductor materials with low defect densities, larger diameters and reproducible compositional uniformity for radar applications.	
	– (U) Develop high performance multispectral sensor materials for the detection of multiple, discrete wavelengths within the infrared spectrum by space based systems.	
	– (U) Establish the design criteria for the development of alternative materials for infrared detection.	
	– (U) Identify innovative materials solutions to infrared imaging of complex targets such as chemical, biological or deeply buried/heavily camouflaged threats, from space based systems.	
– (U) \$5,905	Develop materials to enhance the survivability of aircrews against laser threats and heat seeking infrared (IR) missiles.	
	– (U) Identify second generation, nonlinear organic materials for protection of personnel eyes, viewing systems, and night vision devices.	
	– (U) Identify and evaluate optimum crystals and techniques for high power wavelength conversion of carbon dioxide and other lasers for IRCM and related applications (e.g., remote sensing of chemical and biological agents).	
– (U) \$1,620	Develop materials to enhance the survivability of air and space sensor systems against laser threats.	
	– (U) Develop mid-infrared nonlinear optical materials for switches and limiters for laser protection.	
	– (U) Develop tunable filter technologies for laser protection devices.	
– (U) \$13,323	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4348
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$870 Develop new materials and processes to provide improved operational capability for Air Force radar and space sensor systems <ul style="list-style-type: none"> – (U) Develop efficient, high yield growth processes and surface preparation for wide-bandgap semiconductor materials (silicon carbide, SiC) for radar and related radio frequency (RF) applications. – (U) Develop multilayered multispectral infrared sensor materials for space applications that respond to combinations of wavelengths within spectral bands and between spectral bands. – (U) Investigate infrared detection using alternative materials (other than mercury cadmium telluride or extrinsic silicon) to minimize cryocooler requirements for space-based systems and verify the utility of the materials for very long wavelength detection; determine the flexibility of response of the alternative materials for other spectral regions. – (U) Study and evaluate innovative materials solutions to infrared imagery of complex targets such as chemical, biological or deeply buried/heavily camouflaged threats, from space-based systems. – (U) \$3,866 Develop materials to enhance the survivability of aircrews against laser threats and heat seeking infrared (IR) missiles. <ul style="list-style-type: none"> – (U) Evaluate second generation, nonlinear organic materials for protection of personnel eyes, viewing systems, and night vision devices. – (U) Develop next generation optimum crystals and techniques for high-power wavelength conversion of laser sources for Infrared Countermeasure (IRCM) and related applications (e.g., remote sensing of chemical and biological agents). – (U) \$773 Develop materials to enhance the survivability of air and space sensor systems against laser threats. <ul style="list-style-type: none"> – (U) Validate mid-infrared nonlinear optical materials for switches and limiters for laser protection. – (U) Validate tunable filter technologies for laser protection devices. – (U) 5,509 Total 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4348																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">13,007</td> <td style="text-align: center;">13,981</td> <td style="text-align: center;">13,698</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">12,788</td> <td style="text-align: center;">13,323</td> <td style="text-align: center;">5,509</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0603112F, Advanced Materials for Weapon Systems. - (U) PE 0602202F, Armstrong Laboratory Exploratory Development. - (U) PE 0602204F, Aerospace Avionics. - (U) PE 0603231F, Crew Systems and Personnel Protection Technology. - (U) PE 0603211F, Aerospace Systems. - (U) Tri-Service Laser Hardening Materials and Structures Group. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	13,007	13,981	13,698	Cont	(U) Current Budget Submit/FY 1999 PB	12,788	13,323	5,509	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	13,007	13,981	13,698	Cont														
(U) Current Budget Submit/FY 1999 PB	12,788	13,323	5,509	Cont														
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4349
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4349 Materials Technology for Sustainment	13,673	14,057	15,052	15,555	16,925	16,484	16,880	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Develops materials to provide operational support to Air Force mission areas by providing technologies to inspect the quality of delivered systems, transitioning more reliable and maintainable materials, establishing capability to detect and characterize performance threatening defects, eliminating the dependency on hazardous and toxic materials in repair and maintenance, and providing quick reaction support to the operational commands and repair centers. Non-destructive inspection/evaluation (NDI/E) methods are essential to ensure optimum quality in the design and production of aircraft, spacecraft, propulsion, and missile systems. NDI/E methods are essential to monitor and detect the onset of any service-initiated damage and/or deterioration. This project develops techniques that increase the capability and reliability of currently used methods to detect and characterize performance threatening defects in metallic and nonmetallic composite structures.

(U) FY 1997 (\$ in Thousands):

- (U) \$4,871 Develop NDI/E technologies to evaluate and characterize damage in complex, low-observable materials and structures. Develop NDI/E technologies to inspect and maintain integrity of aging aircraft and missile structures and aeropropulsion systems.
 - (U) Identified and evaluated corrosion and crack detection characterization technologies for the inspection of airframe structures.
 - (U) Demonstrated NDI/E technologies for the characterization of fiber-reinforced composite materials and structures.
 - (U) Identified and evaluated NDI/E technologies for the characterization of low-observable materials and structures.
- (U) \$6,883 Develop support capabilities, information, and processes to resolve problems in the use of materials, or in conducting failure analysis of components. Develop a materials database for transition of materials to aerospace systems. Maintain a handbook and develop guidelines for materials repair of aircraft structures.
 - (U) Demonstrated an advanced non-chromate treatment for corrosion resistance and surface hardening in aircraft structural materials.
 - (U) Demonstrated technology for improved composite repairs and composite repairs on metals.
 - (U) Demonstrated improved non-hazardous cleaning techniques for liquid oxygen lines and solid state electronics.
 - (U) Evaluated technologies and material candidates for a biodegradable chaff.
 - (U) Developed alternative paint/depaint technologies to reduce or eliminate volatile organic compounds.
 - (U) Established in-house, high-frequency testing capability for aerospace structural materials.
 - (U) Assessed material properties of a new materials for military engine applications.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	
<ul style="list-style-type: none"> - (U) \$1,919 - (U) \$13,673 	<p>Develop alternative materials, processes and environmentally friendly technologies which will eliminate dependency on hazardous and toxic substances in the acquisition, maintenance and repair on aerospace systems.</p> <ul style="list-style-type: none"> - (U) Demonstrated techniques for in place cleanliness measurements and develop laser based cleaning technology. - (U) Developed coatings, coating/coating remove processes and surface treatments to reduce or eliminate Volatile Organic Compounds, Hazardous Air Pollutants, and the use of banned substances. - (U) Developed materials and processes to replace hazardous plating operations. <p>Total</p>	
(U) <u>FY 1998 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$4,983 	<p>Non-destructive inspection/evaluation (NDI/E) methods are essential to ensure optimum quality in the design and production of aircraft, spacecraft, and launch systems. This area is developing NDI/E technologies evaluate and characterize damage in complex, low-observable materials and structures and NDI/E technologies to to inspect and maintain integrity of aging aerospace structures and propulsion systems.</p> <ul style="list-style-type: none"> - (U) Demonstrate NDI/E technologies for the semi-automated characterization of fiber-reinforced composite materials and structures and identify capability to develop remote inspection within complex structures. - (U) Develop corrosion and crack detection characterization technologies for the inspection of aging airframe structures. - (U) Develop NDI/E technologies for the structural and electromagnetic characterization of low-observable materials and structures. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4349
– (U) \$7,203	Develop support capabilities, information, and processes to resolve problems in the use of materials, or in conducting failure analysis of components. Develop a materials database for transition of materials to aerospace systems. Maintain a handbook and develop guidelines for materials repair of aircraft structures. Develop technical understanding of corrosion to model and reduce corrosion in aircraft structures. Assess emerging structures joining technologies for application to new alloys not currently weldable.	
	– (U) Define effects of corrosion through establishment of corrosion classification methodology and survey domestic and international industrial base to define most promising environmentally compliant coating technologies for corrosion prevention and control.	
	– (U) Develop new engineering specifications and or guidelines for selecting corrosion resistant alloys as material substitutes in aircraft structural applications.	
	– Validate high-frequency/high cycle fatigue testing capability for new aerospace structural materials.	
	– (U) Develop stir/solid-state welding for advanced aerospace structural alloys and participate with aerospace industry to assess new joining technologies for application to Air Force systems.	
	– (U) Support transition of phenolic coated fasteners and joining technology for use on large aircraft structures.	
	– (U) Evaluate materials and processes for repairs of high temperature composite structures and develop on-aircraft techniques for advanced surface treatments.	
	– (U) Provide quick reaction technical support in the areas of fluids, sealants, elastomers, adhesives, and composites to Air Force field units and Air Logistics Centers.	
– (U) \$1,871	Develop alternative materials, processes and environmentally friendly technologies which will eliminate dependency on hazardous and toxic substances in the acquisition, maintenance and repair on aerospace systems.	
	– (U) Develop Sol-Gel technology as a surface treatment prior to coating and bonding operations, and evaluate the performance of surface treatment techniques which could replace chrome plating operations.	
	– (U) Develop laser-based technology for the precision cleaning of aerospace components.	
	– (U) Evaluate the performance of coatings, coating/coating removal processes and surface treatments developed to reduce or eliminate Volatile Organic Compounds, Hazardous Air Pollutants, and the use of banned substances.	
– (U) \$14,057	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602102F Materials	PROJECT 4349
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li> <p>– (U) \$5,315 Non-destructive inspection/evaluation (NDI/E) methods are essential to ensure optimum quality in the design and production of aircraft, spacecraft, and launch systems. This area is developing NDI/E technologies evaluate and characterize damage in complex, low-observable materials and structures, and NDI/E technologies to inspect and maintain integrity of aging aerospace structures and propulsion systems.</p> <ul style="list-style-type: none"> <li>– (U) Demonstrate corrosion and crack detection characterization technologies for the inspection of aging airframe structures and develop capabilities for the detection of the onset of hidden corrosion. <li>– (U) Demonstrate NDI/E technologies for the structural and electromagnetic characterization of low-observable materials and structures and identify and evaluate NDI/E technologies to assess advanced technology low-observable coatings. <li>– (U) Identify and evaluate NDI/E technologies for the characterization of solid rocket motors and develop X-ray computed tomography and microtomography methods to complement metallographic and other materials and processes analysis techniques. <li>– (U) Identify/evaluate NDI/E techniques to provide process sensing capabilities information for enhanced control of aerospace materials processing. <li> <p>– (U) \$7,670 Develop support capabilities, information, and processes to resolve problems in the use of materials, or in conducting failure analysis of components. Develop a materials database for transition of materials to aerospace systems. Maintain a handbook and develop guidelines for materials repair of aircraft structures. Develop technical understanding of corrosion to model and reduce corrosion in aircraft structures. Assess emerging joining structures technologies for application to new alloys not currently weldable.</p> <ul style="list-style-type: none"> <li>– (U) Assess effects of corrosion to damage tolerance on materials / structures through testing on simple structures. <li>– (U) Develop test methodologies and industrial consensus standardization activities required to conduct and assess performance of environmentally compliant coatings. <li>– (U) Measure and characterize the threshold for fatigue propagation values for engine materials. <li>– (U) Assess and provide improvements for joining of new high performance alloys and transition joining techniques to industry and Air Logistics Centers while providing technical support on procedures and process control techniques. <li>– (U) Develop procedures for on-aircraft repair of high temperature composites and optimize and demonstrate advanced surface preparation technologies. <li>– (U) Provide quick reaction technical support in the areas of fluids, sealants, elastomers, adhesives, and composites to Air Force field, Air Logistics Centers, and System Program Offices. <li> <p>– (U) \$2,067 Develop alternative materials, processes and environmentally friendly technologies which will eliminate dependency on hazardous and toxic substances in the acquisition, maintenance and repair on aerospace systems.</p> <ul style="list-style-type: none"> <li>– (U) Evaluate environmentally friendly coating and surface treatment processes and the use of laser based cleaning technology. <li>– (U) Evaluate the performance of materials and processes developed as alternatives to hexavalent chrome plating. <li> <p>– (U) 15,052 Total</p> 		
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	62,507	57,446	64,932	63,212	63,305	63,780	67,491	Continuing	Continuing
2401 Structures	15,228	15,642	17,644	18,028	18,438	18,308	18,848	Continuing	Continuing
2402 Vehicle Equipment	11,177	9,932	11,836	7,762	7,362	7,404	7,835	Continuing	Continuing
2403 Flight Controls and Pilot-Vehicle Interface	19,260	16,291	17,733	18,721	19,190	19,870	20,689	Continuing	Continuing
2404 Aeromechanics and Integration	14,977	15,115	16,347	16,749	16,759	17,233	17,688	Continuing	Continuing
4397 Air Base Technology	1,865	466	1,372	1,952	1,556	965	2,431	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** This Applied Research program determines the technical feasibility of air vehicle technologies in aeromechanics, structures, flight control, vehicle-pilot integration, vehicle subsystems, and air base operability to reduce life cycle costs and improve the performance of existing and future air vehicles, and the maintenance and survivability of air bases. The payoffs from these technology programs include: increased survivability, affordability, reliability, maintainability, and supportability for air vehicles and subsystems; improved air base operability; and safe air vehicle all-weather operations. Note: In FYs 1999 and out, additional emphasis has been placed on aerospace flight dynamics technologies that can be applied to prolonging the life of our aging aircraft fleet.

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	62,934	60,509	65,039	Cont
(U) Appropriated Value	65,080	60,509		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,379	-2,461		
b. SBIR	-661	-602		
c. Omnibus/Other Above Threshold Reprogrammings				
d. Below Threshold Reprogrammings	-450			
e. Rescissions	-83			
(U) Adjustments to Budget Year Since FY 1998 PB			-107	
(U) Current Budget Submit/FY 1999 PB	62,507	57,446	64,932	Cont

(U) Change Summary Explanation:

Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary: Not Applicable.

(U)

D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics				PROJECT 2401		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2401	Structures	15,228	15,642	17,644	18,028	18,438	18,308	18,848	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops advanced aircraft structures; investigates new structural concepts and design techniques which exploit new materials and fabrication processes to strengthen and extend the life of air vehicle structures while reducing weight and cost; and develops "smart" structures that will have embedded sensors to report stress, fatigue, and/or battle damage, leading to improved maintainability.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$523 Design, develop, and test advanced structures/concepts which incorporate distributed vibration suppression technologies for life extension and exploit wing warping, camber shaping, and adaptive structures technologies that enhance air vehicle performance. <ul style="list-style-type: none"> - (U) Conducted testing of embedded, distributed vibration suppression techniques for aircraft structures to enhance vehicle performance. - (U) Conducted testing of "smart stiffness" wing warping concepts to reduce aircraft weight, drag, and radar signature, and to alleviate fighter aircraft vertical tail buffet and fatigue damage. - (U) Developed scaling laws and procedures that incorporate "smart" structures techniques into full-scale aircraft structures which could lead to eliminating the need for discrete control surfaces. - (U) \$2,228 Develop advanced structural concepts and design methods that will enhance affordability and survivability of upgraded, derivative, and future aircraft. <ul style="list-style-type: none"> - (U) Designed, fabricated, and assessed advanced composite structures technologies which demonstrate the potential for 30% manufacturing and 20% support cost savings while providing improved battle damage tolerance over existing structures. - (U) Developed initial analytical aeroelastic techniques and methods to provide design guidance for structural flutter clearance for new weapons/store configurations on existing aircraft in lieu of expensive flight testing. - (U) \$11,131 Extend usable structural lives of aging aircraft through proven techniques that account for life, risk, repairs, and dynamic loads. <ul style="list-style-type: none"> - (U) Developed corrosion analysis metrics to assess corrosion fatigue effects on inspection and maintenance intervals. - (U) Developed crack growth analysis and preliminary probabilistic risk assessment techniques which incorporate widespread fatigue damage effects to better predict structural component service life. - (U) Developed techniques to analyze bonded-composite repairs of metallic structures which eliminate the need for riveted/bolted metal repair patches. - (U) Designed and developed weapon bay acoustic suppression techniques to increase the performance of current and future air vehicles. 										
Project 2401			Page 3 of 23 Pages				Exhibit R-2 (PE 0602201F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 2401
<ul style="list-style-type: none"> - (U) \$1,346 - (U) \$15,228 	<ul style="list-style-type: none"> Improved durability for existing stealth vehicles structures operating in extreme environments such as temperature, noise, and vibration caused by engine exhaust. - (U) Developed concepts for low-observable ceramic composite exhaust structures of stealth vehicles that significantly increase life and decrease costs. - (U) Developed passive structural temperature control concepts to reduce infrared signature of current fleet. Total 	
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$609 - (U) \$2,109 	<ul style="list-style-type: none"> Design, develop, and test advanced structures/concepts that incorporate distributed vibration suppression technologies for life extension and exploit wing warping, camber shaping, and adaptive structures technologies that enhance air vehicle performance. - (U) Evaluate promising active distributed vibration suppression techniques using embedded actuator design concepts for aircraft structural applications. - (U) Conduct wind tunnel and ground assessment tests of wing warping, camber shaping, and “smart stiffness” structural concepts to reduce aircraft weight, drag, and radar signature, and to alleviate fighter aircraft vertical tail buffet and fatigue damage. - (U) Evaluate scaling laws and procedures needed to incorporate “smart” structures techniques into full-scale aircraft structures and, thus, eliminate the need for discrete control surfaces. Develop advanced structural concepts and design methods that will enhance affordability and survivability of upgraded, derivative, and future aircraft. - (U) Design, fabricate, and assess advanced composite structures technologies which demonstrate the potential for 30% manufacturing and 20% support cost savings while providing improved battle damage tolerance over existing structures. Complete evaluation and assessment of cost benefits from applying full-scale, primary, composite sandwich structure fabrication methods to air vehicles. - (U) Exercise analytical techniques needed to provide design guidance for future use of active aeroelastic wings. - (U) Demonstrate integration of advanced methods in aerodynamics, controls, signatures, testing, manufacturing, etc. with structural design methods to facilitate more efficient development of aircraft systems. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	
		PROJECT 2401
– (U) \$11,440	Extend usable structural lives and/or reduce costs of aging aircraft through proven techniques that account for life, risk, repairs, and dynamic loads. <ul style="list-style-type: none"> – (U) Develop life prediction analysis techniques to assess corrosion fatigue effects on inspection and maintenance intervals. – (U) Develop mature probabilistic risk assessment techniques which incorporate widespread fatigue damage effects to better predict structural component service life. – (U) Further develop techniques to analyze bonded-composite repairs of metallic structures and to optimize repair design. – (U) Evaluate and assess weapon bay acoustic suppression techniques to increase the weapons delivery envelope of current and future air vehicles. 	
– (U) \$1,484	Improve durability for existing and future stealth vehicles structures operating in extreme environments such as temperature, noise, and vibration caused by engine exhaust. <ul style="list-style-type: none"> – (U) Evaluate floating deck concepts for low-observable ceramic composite exhaust structures of stealth vehicles that significantly increase life and decrease costs. – (U) Complete assessment of passive high performance ceramic matrix composite technology/concepts for exhaust washed structures. – (U) Develop active structural temperature control concepts to reduce infrared signature of current fleet. 	
– (U) \$15,642	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 2401
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$800 Design, develop, and test advanced structures/concepts that incorporate distributed vibration suppression technologies for life extension and exploit wing warping, camber shaping, and adaptive structures technologies that enhance air vehicle performance. <ul style="list-style-type: none"> – (U) Complete the evaluation and assessment of active distributed vibration suppression techniques using embedded actuator design concepts. Develop scaling laws and procedures needed to transition this technology to full-scale aircraft structures. – (U) Continue evaluation and assessment of wing twisting and control surface warping structural concepts to reduce aircraft weight and drag and to increase maneuverability and survivability. Assess application of these design concepts and design procedures to inhabited and uninhabited combat air vehicles. – (U) Develop advanced structural design concepts based on the established scaling laws, procedures, and concept testing that incorporate “smart” structures and materials into full-scale, multidisciplinary aircraft structures. – (U) \$3,407 Develop advanced structural concepts and multidisciplinary design optimization methods that will enhance affordability and survivability of upgraded, derivative, and future aircraft. <ul style="list-style-type: none"> – (U) Correlate analytical methods with ground test data to provide guidance for future use of active aeroelastic wings. – (U) Design, fabricate, and assess advanced composite structures technologies which demonstrate the potential for 30% manufacturing and 20% support cost savings while providing improved battle damage tolerance over existing structures. Complete evaluation and assessment of cost benefits of incorporating a survivable, decoupled fuel cell design into air vehicle structures. – (U) Complete demonstration of integration of advanced methods in aerodynamics, controls, signatures, testing, manufacturing, etc. with structural design methods to facilitate more efficient development of aircraft systems. – (U) \$12,087 Extend usable structural lives and/or reduce costs of aging aircraft through proven techniques that account for life, risk, repairs, and dynamic loads. <ul style="list-style-type: none"> – (U) Validate analysis methodology and metrics to assess corrosion fatigue effects on inspection and maintenance intervals and restoral strength. – (U) Evaluate probabilistic techniques to assess risk of failure of structural component subject to widespread fatigue damage. – (U) Validate repair design tool for bonded-composite repairs of metallic structures, eliminating riveted/bolted metal repair patches. – (U) Demonstrate weapon bay preliminary active, acoustic suppression techniques to increase the performance envelope of current and future air vehicles and develop sonic fatigue damage and suppression techniques. – (U) \$1,350 Improve durability for existing and future aircraft structures by developing concepts that incorporate advanced materials as well as passive and active cooling to withstand the extreme environments of high temperatures, vibrations, and acoustic noise. <ul style="list-style-type: none"> – (U) Design structurally integrated thermal energy management system and ceramic matrix composite components compatible with low-observable vehicles that significantly increase life and decrease costs. – (U) Develop durable thermal protection systems using advanced materials to reduce operations and support costs. 		
Project 2401	Page 6 of 23 Pages	Exhibit R-2 (PE 0602201F)

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BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
0602201F Aerospace Flight Dynamics

- (U) \$17,644 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 2401
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	15,698	16,604	17,999	Cont
(U) Current Budget Submit/FY 1999 PB	15,228	15,642	17,644	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602269F, Hypersonic Technology Development.
- (U) PE 0603211F, Aerospace Structures.
- (U) PE 0603112F, Advanced Materials for Weapon Systems.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics				PROJECT 2402		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2402	Vehicle Equipment	11,177	9,932	11,836	7,762	7,362	7,404	7,835	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: This project develops technologies to reduce subsystem and component life cycle costs, improve vehicle/crew member survival in operational environments, and improve subsystem performance for current and future flight vehicles.</p> <p>(U) FY 1997 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$3,099 Design, develop, and assess component damage repair technologies that increase air vehicle survivability. <ul style="list-style-type: none"> - (U) Developed preliminary experimental techniques and analytical tools which define effects of various ballistic threats against a variety of structural components. - (U) \$2,881 Design, develop, and assess subsystem technologies to enhance air vehicle protection and survivability. <ul style="list-style-type: none"> - (U) Developed an abrasion-resistant coating for next generation injection molded transparencies to fabricate single-piece canopies for increased affordability and a factor of five reduction in life cycle costs. - (U) Developed the capability to conduct transparency tests that determine degradation of performance and supportability. - (U) Developed approaches that alleviate transparency electrostatic discharge and reduce component degradation and life cycle costs. - (U) \$2,640 Design, develop, and assess technologies for aircraft internal thermal energy management systems. <ul style="list-style-type: none"> - (U) Completed initial concept demonstrator for integrated subsystems design methodologies. - (U) Fabricated and tested thermal system composite material components to achieve 50% reduction in weight and size. - (U) Designed and tested enhanced heat exchanger model to improve aircraft temperature control system performance. - (U) \$2,557 Design, develop, and assess advanced landing gear concepts for improving performance and supportability of air vehicle subsystems. <ul style="list-style-type: none"> - (U) Designed, developed, and assessed scientific methods for predicting and measuring landing gear stability. - (U) Developed lightweight landing gear technology to gain overall aircraft performance and efficiency. - (U) \$11,177 Total 										
Project 2402		Page 8 of 23 Pages				Exhibit R-2 (PE 0602201F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 2402
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$3,560 Design, develop, and assess component combat damage repair technologies, fire suppression techniques, hydrodynamic ram tolerance techniques, and critical component armoring techniques that increase air vehicle survivability. <ul style="list-style-type: none"> – (U) Develop mature experimental techniques and analytical tools to define and reduce effects of various missile and ballistic threats on critical structural components, vehicle fuel/fluid systems and internal munitions. – (U) Develop preliminary analytical models to predict air vehicle vulnerability and evaluate alternative techniques for vulnerability reduction. – (U) Establish the methodology for lightweight armoring of critical components. – (U) Define and evaluate models and criteria for sizing and selecting fire suppression techniques to use in engine nacelles, dry bays, cargo bays, and internal munitions bays. – (U) \$2,938 Design, develop, and assess subsystem technologies to enhance air vehicle protection and survivability. <ul style="list-style-type: none"> – (U) Establish the capability to conduct dust erosion tests for predicting transparency coating performance/durability degradation at speeds up to Mach 1.5. – (U) Demonstrate the methodology to verify the compliance of transparency designs with the electrostatic discharge damage protection criteria. – (U) \$3,434 Design, develop, and assess technologies for aircraft internal energy management systems. <ul style="list-style-type: none"> – (U) Define technologies and approaches which allow an assessment of aircraft subsystem energy interactions. – (U) Develop a detailed roadmap of modeling, methodologies, and technologies required for development of a capability for system-based design trade offs of air vehicle components, subsystems, and stores. – (U) Fabricate a full-scale advanced composite material heat exchanger; demonstrate 50% reduction in weight and size. – (U) \$9,932 Total 		
Project 2402	Page 9 of 23 Pages	Exhibit R-2 (PE 0602201F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics PROJECT 2402	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$3,300 Design, develop, and assess component combat damage repair technologies, fire suppression techniques, hydrodynamic ram tolerance techniques, and critical component armoring techniques that increase air vehicle survivability. <ul style="list-style-type: none"> – (U) Complete development of experimental techniques and analytical tools to define and reduce efforts of various missile and ballistic threats on critical structural components, vehicle fuel/fluid systems and internal munitions. – (U) Develop mature analytical models to predict air vehicle vulnerability and to evaluate alternative techniques for vulnerability reduction. – (U) Establish the criteria for evaluating alternative techniques for armoring of critical components. – (U) Validate criteria and models for requiring, sizing, and selecting fire suppression techniques to use in engine nacelles, dry bays, cargo bays, and internal munitions bays. – (U) \$4,862 Develop and assess process for affordable structural life. <ul style="list-style-type: none"> – (U) Conduct element and development testing for corrosion fatiguers predictive models, assess their utility in predicting structural integrity, life cycle and required intervals of inspection for corrosion affected components in existing aircraft structures. – (U) Develop composite repair process for damaged and cracked components in existing aircraft structures. – (U) Develop predictive model and repair techniques for widespread fatigue damage in existing aircraft structures. – (U) Develop noise suppression techniques to reduce structural damage in weapons bays of existing aircraft. – (U) Identify and develop new analysis methods and design criteria for advanced composite structures. – (U) \$3,674 Design, develop and assess technologies for aircraft internal energy management systems. <ul style="list-style-type: none"> – (U) Develop breadboard for system-based design trade off of air vehicle components and subsystems. – (U) Validate high efficiency aircraft thermal energy management system components – (U) Evaluate and assess advanced heat transfer techniques based on electrohydrodynamic principles. – (U) Evaluate injected aircraft transparencies in laboratory environments. – (U) \$11,836 Total 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics		PROJECT 2402															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">11,192</td> <td style="text-align: center;">10,421</td> <td style="text-align: center;">10,880</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">11,177</td> <td style="text-align: center;">9,932</td> <td style="text-align: center;">11,836</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: Changes to this project since the previous President's Budget are due to increased emphasis on flight vehicle equipment efforts within the Science and Technology (S&T) Program.</p> <p style="padding-left: 20px;">Schedule: Not Applicable.</p> <p style="padding-left: 20px;">Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p style="padding-left: 20px;">(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0603106F, Logistics System Technology. - (U) PE 0603205F, Flight Vehicle Technology. - (U) PE 0603245F, Flight Vehicle Technology Integration. - (U) PE 0604212F, Aircraft Equipment Development. - (U) PE 0604609F, Reliability and Maintainability Technology Insertion Program. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	11,192	10,421	10,880	Cont	(U) Current Budget Submit/FY 1999 PB	11,177	9,932	11,836	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	11,192	10,421	10,880	Cont														
(U) Current Budget Submit/FY 1999 PB	11,177	9,932	11,836	Cont														
Project 2402	<i>Page 11 of 23 Pages</i>		Exhibit R-2 (PE 0602201F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 2403
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2403 Flight Controls and Pilot-Vehicle Interface	19,260	16,291	17,733	18,721	19,190	19,870	20,689	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification:** This project develops technology to enable the pilot to obtain maximum performance from the aircraft under all conditions, provide the pilot with the display of information from on-board subsystems and off-board intelligence sources for increased situational awareness leading to enhanced mission performance and flight safety, provide robust capability to control aircraft after damage and failures, and network synthetic environments for evaluation of advanced concepts.

- (U) FY 1997 (\$ in Thousands):
- (U) \$5,886 Develop and demonstrate advanced flight control techniques to provide air combat advantage by increasing performance and survivability while decreasing cost and supportability requirements.
 - (U) Continued developing advanced control concepts such as advanced actuators and wing flexing.
 - (U) Developed central control system to support groups of manned and unmanned aircraft to increase mission effectiveness and attack options.
 - (U) \$5,110 Develop new flight control design methods and criteria that provide air combat advantage by increasing performance and survivability while decreasing cost.
 - (U) Selected and evaluated reconfigurable flight control techniques which allow battle damaged, reduced signature aircraft to fly safely.
 - (U) Developed criteria and designed standards for flight control systems that prevent pilot-induced control problems and improve handling qualities.
 - (U) \$4,727 Develop enhanced vehicle-pilot integration technologies to improve overall weapon systems performance and exploit real-time on-board/off-board data.
 - (U) Developed vehicle-pilot integration capabilities allowing two-person, mobility and special operations cockpits to access threat intelligence information in-flight.
 - (U) Developed vehicle-pilot integration technologies for single-seat fighter-bombers operating in high threat environments.
 - (U) \$3,537 Develop capabilities to evaluate ways to increase performance and survivability while decreasing cost and supportability requirements.
 - (U) Developed techniques incorporating long distance networking to support modeling of close-in and high angle-of-attack air combat.
 - (U) \$19,260 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 2403
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$4,918 Develop and demonstrate advanced flight control techniques to provide air combat advantage by increasing performance and survivability while decreasing cost and supportability requirements. <ul style="list-style-type: none"> – (U) Continue developing advanced control concepts and advanced actuation development enabling reduced structural weight and cost while increasing survivability and decreasing logistical support. – (U) Develop control strategies that enable interactive and cooperative flights of manned and unmanned aircraft to increase mission effectiveness, attack options, and all weather point-of-use delivery. – (U) Develop risk reduction strategies and global operational analyses for advanced optical air data sensor development. – (U) Develop open control system infrastructure that enables commercial processors and data busses in flight critical applications. – (U) \$4,236 Develop new flight control design methods and criteria that provide air combat advantage by increasing performance and survivability while decreasing cost. <ul style="list-style-type: none"> – (U) Continue to develop design criteria and standards for flight control systems that prevent pilot induced control problems. – (U) Start effort to update handling qualities handbook for use by the acquisition community. – (U) Continue development of reconfigurable flight control techniques that allow battle damaged, reduced signature aircraft to fly safely. – (U) Select and assess new methods that will improve prediction of non-linear aerodynamic modeling for use in design simulations. – (U) Develop control technologies for global range transport aircraft. – (U) \$2,099 Develop enhanced vehicle-pilot integration technologies to improve overall weapon systems performance and exploit real-time on-board/off-board data. <ul style="list-style-type: none"> – (U) Develop display format requirements for integrating in-flight mission planning and automated low-level flight. – (U) Review operator mission requirements; assess availability/applicability of human-machine interface technologies. – (U) Initiate development of vehicle-pilot/operator integration techniques as they relate to uninhabited combat vehicles. – (U) \$3,261 Develop control integration technologies and simulations for uninhabited combat air vehicles. <ul style="list-style-type: none"> – (U) Incorporate multi-element combat environment and scenarios for an uninhabited combat air vehicle air-to-ground baseline. – (U) \$1,777 Develop capabilities to evaluate ways to increase performance and survivability while decreasing cost and supportability requirements. <ul style="list-style-type: none"> – (U) Support the development of high angle-of-attack air combat and weapon targeting technology assessment tools. – (U) \$16,291 Total 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 2403
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5,142 Develop and demonstrate advanced flight control techniques to provide air combat advantage by increasing performance and survivability while decreasing cost and supportability requirements. <ul style="list-style-type: none"> - (U) Complete simulations and continue firmware development of advanced control concepts enabling reduced structural weight and cost. - (U) Complete demonstration of a low-cost alternative to conventional actuators and continue advanced actuation development to increase survivability while decreasing logistical support train. - (U) Continue developing control strategies that enable interactive and cooperative flights of manned and unmanned aircraft to increase mission effectiveness, attack options and all weather point-of-use delivery. - (U) Complete risk reduction assessment and global operational analyses for advanced optical air data sensor development. - (U) Complete evaluation of open control system infrastructure incorporating commercial processors and data busses in flight critical applications. - (U) \$4,677 Develop new flight control design methods and criteria that provide air combat advantage by increasing performance and survivability while decreasing cost. <ul style="list-style-type: none"> - (U) Validate reconfigurable flight control techniques which allow battle damaged, reduced signature aircraft to fly safely. - (U) Evaluate on-board techniques to detect and alleviate pilot-induced control problems. - (U) Validate design standards for flight control systems that prevent pilot-induced control problems. - (U) Evaluate methods for improving modeling of non-linear aerodynamics for use in design simulations. - (U) Evaluate control technologies for global range transport aircraft. - (U) \$2,339 Develop enhanced vehicle-pilot integration technologies to improve overall weapon system performance and exploit real-time on-board/off-board data. <ul style="list-style-type: none"> - (U) Continue development and evaluate vehicle-pilot integration technologies for in-flight mission planning and automated low-level flight. - (U) Develop advanced pilot decision aids to improve tactical landing approaches and air-to-air situational awareness. - (U) Continue review of operator mission requirements; evaluate availability/applicability of human-machine interface technologies. - (U) Develop pilot-operator integration technologies for mission re-planning task consent, and system status information. - (U) \$3,598 Develop capabilities to evaluate ways to increase performance and survivability while decreasing cost and supportability requirements. <ul style="list-style-type: none"> - (U) Perform comparison tests of combat aiding technologies through international network air combat simulation. - (U) Develop evaluation techniques for the assessment of mission effectiveness for uninhabited combat air vehicles. 		
Project 2403	Page 14 of 23 Pages	Exhibit R-2 (PE 0602201F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602201F Aerospace Flight Dynamics	2403
– (U) \$1,977	Develop control integration technologies and simulations for uninhabited combat aerial vehicles.	
	– (U) Continue expansion of uninhabited combat air vehicle air-to-ground simulation and establishment of a baseline.	
	– (U) Initiate integration of advances in command generation, control architecture, and flight management technologies into a flight control system for uninhabited combat air vehicles.	
–(U) \$17,733	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 2404
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2404 Aeromechanics and Integration	14,977	15,115	16,347	16,749	16,759	17,233	17,688	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops aerodynamic design integration technologies for current and future flight vehicles, focusing on speed regimes ranging from low to high Mach. These technologies have potential to reduce costs, improve range to yield enhanced global force projection, improve maneuverability, and reduce observability. This project integrates technologies into air vehicle concepts and develops design assessment and analysis tools.

(U) FY 1997 (\$ in Thousands):

- (U) \$8,863 Develop and demonstrate affordable technologies to increase aerodynamic performance and survivability through reduced drag, improved fuel fraction, enhanced maneuverability and control, and reduced signature.
 - (U) Completed advanced, low-cost, compact engine inlet designs to increase mission range of combat aircraft.
 - (U) Completed advanced concept development for fluid, low-cost, reduced signature, thrust-vectoring nozzles.
 - (U) Completed study of high-lift aerodynamic concepts to reduce landing take-off distances for affordable, survivable transport aircraft.
 - (U) Completed development of low-drag/low-observable aerodynamic weapons carriage concepts to increase weapons payload and air vehicle range and survivability.
 - (U) Developed concepts and design criteria for advanced, affordable, intermediate-range, manned and unmanned aircraft to provide fast reaction strike capability.
 - (U) Developed high-payoff aerodynamic concepts that significantly extend combat aircraft mission range.
 - (U) Investigated variable geometry, continuous moldline, external fuel tank concepts to extend fighter mission range.
 - (U) Investigated active flow control concepts for low-observable fighter take-off/landing and maneuver performance enhancement.
 - (U) Investigated methods for reducing aeroacoustic damage in aircraft twin nozzle installations to increase nozzle service life.
- (U) \$2,946 Develop and demonstrate numerical technologies to derive advanced aircraft designs while increasing performance and reducing signature.
 - (U) Completed aerodynamic design optimization code for analysis of aircraft performance and survivability.
 - (U) Initiated development of mathematical models and preliminary assessment and evaluation of aerodynamic and structural interactions in aging aircraft and advanced flight vehicles.
 - (U) Initiated numerically-based analysis capability to support weapons certification, crew escape, and safe paratrooper operation.
 - (U) Initiated development and assessment of rapid, accurate methods to predict aerodynamic performance and to evaluate advanced, affordable air vehicle designs.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics PROJECT 2404	
<ul style="list-style-type: none"> - (U) \$3,168 	<ul style="list-style-type: none"> Developed integrated concepts, design, and analysis tools for fixed wing air vehicles. - (U) Developed architecture for integrating air vehicle design methods for Air Force, Navy, NASA, and industry. - (U) Developed designs for selected baseline aircraft concepts and identified relevant technologies. 	
<ul style="list-style-type: none"> - (U) \$14,977 	<ul style="list-style-type: none"> Total 	
(U) <u>FY 1998 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$8,990 	<ul style="list-style-type: none"> Develop and demonstrate affordable technologies to increase aerodynamic performance and survivability through reducing drag, improving fuel fraction, enhancing maneuverability and control, and reducing signature. - (U) Investigate concepts for aero-structurally integrated compact inlet designs to decrease aircraft weight, cost, and radar detection. - (U) Investigate rapid, low-cost aerodynamic assessment methods to reduce risk of weapon/aircraft integration, carriage, and separation. - (U) Develop aerodynamic configurations that significantly extend the range of unmanned combat aerial vehicles. - (U) Complete development of high-payoff aerodynamic concepts that significantly extend combat aircraft mission range. - (U) Investigate innovative vehicle/weapons aerodynamics that use emerging technologies to increase payload, survivability, and range. - (U) Develop variable geometry, continuous moldline, external fuel tank concepts to extend fighter mission range. - (U) Develop active flow control concepts for low-observable fighter take-off/landing and maneuver performance enhancement - (U) Investigate advanced active flow control devices for nozzle area control, mixing, and thrust vectoring for lightweight affordable flight vehicles. - (U) Assess aerodynamic and aerothermodynamic characteristics of high-speed air vehicle concepts. 	
<ul style="list-style-type: none"> - (U) \$3,083 	<ul style="list-style-type: none"> Develop and demonstrate numerical technologies to derive advanced aircraft designs while increasing performance and reducing signature. - (U) Initiate development of aerodynamic design optimization code for application to tailless aircraft geometry to maximize performance for multiple flight conditions, such as short field take-off and low-drag cruise. - (U) Extend development of mathematical models of aerodynamic and structural interactions in aging aircraft and advanced flight vehicles. - (U) Extend development of numerically-based analysis capability to support weapons certification, crew escape, and safe paratrooper deployment with emphasis on cavity flows. - (U) Extend development and demonstration of rapid, accurate methods to predict and evaluate aerodynamic performance of advanced, affordable air vehicle designs and accelerate development of time-dependent analysis. 	
<ul style="list-style-type: none"> - (U) \$3,038 	<ul style="list-style-type: none"> Develop integrated concepts, design, and analysis tools for fixed wing air vehicles. - (U) Demonstrate modular architecture for integrating air vehicle design and analysis methods for Air Force, Navy, and NASA. - (U) Complete development of "families" of baseline aircraft designs; identify common characteristics needed to facilitate trade studies. - (U) Develop and demonstrate cost estimating tool to determine return on investment for broad range of technologies. 	
<ul style="list-style-type: none"> - (U) \$15,115 	<ul style="list-style-type: none"> Total 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 2404
(U) <u>FY 1999 (\$ in Thousands):</u>		
- (U) \$9,838	Develop and demonstrate affordable technologies to increase aerodynamic performance and survivability through reducing drag, improving fuel fraction, enhancing maneuverability and control, and reducing signature.	
	- (U) Develop aero-structurally integrated compact inlet designs to decrease aircraft weight, cost, and radar detection.	
	- (U) Investigate critical aeromechanical components for survivable, multi-purpose transport aircraft configurations.	
	- (U) Develop rapid, low-cost aerodynamic assessment methods to reduce risk of weapon/aircraft integration, carriage, and separation.	
	- (U) Complete development of aerodynamic configurations that significantly extend the range of unmanned combat aerial vehicles.	
	- (U) Develop innovative vehicle/weapons aerodynamic concepts that use emerging technologies to increase payload, survivability, and range.	
	- (U) Develop variable geometry, continuous moldline, external fuel tank concepts to extend fighter mission range.	
	- (U) Develop active flow control concept development for low-observable fighter take-off/landing and enhanced maneuvering.	
	- (U) Develop advanced active-flow control devices for lightweight and affordable nozzle area control, mixing, and thrust vectoring in air vehicles.	
	- (U) Investigate aerodynamic characteristics of a global range strike/reconnaissance air vehicle concept.	
- (U) \$3,332	Develop and demonstrate numerical technologies to derive advanced aircraft designs while increasing performance and reducing signature.	
	- (U) Extend development of aerodynamic design optimization code for application to entire aircraft geometry to maximize performance for multiple flight conditions, such as short field take-off and low-drag cruise.	
	- (U) Complete mathematical model development of aerodynamic and structural interactions in aging aircraft and advanced air vehicles.	
	- (U) Complete development of numerically-based analysis capability to support weapons certification, crew escape, and safe paratrooper deployment and assessment of acoustic effects.	
	- (U) Complete development and assessment of rapid and accurate methods to predict aerodynamic performance and to evaluate advanced affordable air vehicle designs, including multidisciplinary analyses.	
	- (U) Develop numerically-based method to analyze the performance of aircraft with active flight control surfaces.	
- (U) \$3,506	Develop integrated concepts, design, and analysis tools for fixed wing air vehicles.	
	- (U) Complete development efforts and transition the integrated air vehicle design and analysis tool kit for Air Force, Navy, NASA, and industry air vehicle concepts to the user.	
	- (U) Update designs for "families" of baseline aircraft concepts and identify relevant evolutionary technologies needed.	
	- (U) Complete verification and validation of physics and technology based cost estimating tool to determine return on investment for broad range of aerodynamic technologies.	
- (U) \$16,347	Total	

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 4397
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4397 Air Base Technology	1,865	466	1,372	1,952	1,556	965	2,431	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops technologies for fixed and bare base operations, including airfield pavements, energy systems, automation, air base survivability, air base recovery, protective systems, fire protection, and crash rescue.

(U) FY 1997 (\$ in Thousands):

- (U) \$906 Develop design criteria, methodology, and advanced technology concepts for improved bare base and fixed site applications (e.g., power and environmental utilities, survivable air base structures, and durable or repairable airfield surfaces).
 - (U) Developed applications using lightweight, composite, deployable structures to reduce airlift and manpower requirements.
 - (U) Developed advanced real-time pavement quality control and quality assurance tools.
- (U) \$150 Develop concepts for advanced ground power generators such as high-efficiency solar cells, solid oxide, and commercially-available conversions for reduced size, weight, and cost and increased transportability.
- (U) \$809 Develop aircraft and air base fire fighting technologies (e.g., clean, environmentally safe fire fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and fire fighter training subsystems).
 - (U) Completed study of the impact of JP-8 fuel on aircraft hangar fire protection requirements.
- (U) \$1,865 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$500 Develop aircraft and air base fire fighting technologies (e.g., clean, environmentally safe fire fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and fire fighter training systems.)
 - (U) Develop advanced agents for three-dimensional fire fighting.
 - (U) Complete development of concepts for advanced aircraft hanger fire protection, transition to Advanced Technology Development.
 - (U) Complete development of electromagnetic pulse fire suppression
- (U) \$0 Develop technologies (i.e., utilities and shelters) that improve air mobility systems performance and reduce airlift requirements in support of Air Expeditionary Force (AEF) operations.
 - (U) Complete conceptual design for a logistics fuel for use in fuel cells.
 - (U) Develop air transportable shelters that are lightweight and can be assembled quickly for AEF applications
- (U) \$466 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	
		PROJECT 4397
(U) <u>FY 1999 (\$ in Thousands):</u>		
- (U) \$692	Develop aircraft and air base fire fighting technologies (e.g., clean environmentally safe fire fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment technologies, and fire fighting training systems).	
	- (U) Continue development of advanced agent for three-dimensional fire fighting.	
	- (U) Develop new technologies to improve fire fighting rescue capability (Infrared imaging, data acquisition, and personnel accountability system).	
	- (U) Develop all-weather, unimproved terrain, and autonomous fire fighting capability.	
- (U) \$682	Develop technologies (i.e., utilities and shelters) that improve air mobility systems performance and reduce airlift requirements in support of Air Expeditionary Force (AEF) operations.	
	- (U) Continue development of air transportable shelters.	
	- (U) Develop a deployable waste management system in support of AEF operations.	
	- (U) Develop new rapidly installed lightweight matting from composite materials to replace the existing AM-2 matting.	
- (U) \$1,372	Total	

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602201F Aerospace Flight Dynamics	PROJECT 4397
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	1,868	500	1,494	Cont
(U) Current Budget Submit/FY 1999 PB	1,865	466	1,372	Cont

(U) **Change Summary Explanation:**

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0603205F, Flight Vehicle Technology.
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.
- (U) PE 0603307F, Air Base Operability Advanced Development.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	86,404	72,118	60,805	55,802	57,661	54,197	53,419	Continuing	Continuing
1123 Manpower, Personnel, and Training	20,139	18,846	14,534	12,275	13,660	12,392	12,754	Continuing	Continuing
1710 Logistics Technology	5,875	5,060	3,365	3,057	3,194	3,236	3,360	Continuing	Continuing
1900 Environmental Quality Technology	9,651	4,248	3,807	3,045	1,097	1,756	0	0	Continuing
7184 Crew Technology	30,337	25,435	26,395	27,625	28,029	25,837	27,104	Continuing	Continuing
7755 Aircrew Physiology Technology	6,481	4,496	0	0	0	0	0	0	Continuing
7757 Toxicology/Radiation/Noise Hazards	13,921	14,033	12,704	9,800	11,681	10,976	10,201	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Applied Research program establishes technology feasibility and develops the technology base for Air Force human interface needs required for weapon systems, operational readiness, and environmental quality. The program addresses crew systems; manpower, personnel, training, and logistics; aerospace physiology investigation; occupational and environmental safety; and environmental compliance and site remediation. Crew systems technologies increase the performance of humans in weapon systems operation by improving aircrew life support systems, man-machine integration (to include aircraft information display systems), and protection from biodynamic forces (ejection/escape). Manpower, personnel, training, and logistics technologies focus on reducing manpower required to operate and support weapon systems by: providing more effective methods to classify, train, and retain warfighters and their support force; modeling human cognitive functioning on complex tasks to enhance operational performance; increasing weapon systems supportability; and improving wartime logistics planning. Occupational and environmental health and safety technologies support deployment, operation, and maintenance of Air Force weapon systems by developing: occupational and operational exposure safety guidelines for militarily relevant electromagnetic radiations and toxicants; detection, control, reduction, and disposal of pollutants from Air Force operations; and cleaning up contaminated Air Force sites. Payoff from these technology development efforts is to improve combat effectiveness by expanding all parameters defining operational performance limits. Note: Congressional add of \$2 million in FY 1997 for Helmet-Mounted Display technologies (Project 7184) explains part of the decrease from FY 1997 to FY 1998. The remaining decrease in FY 1999 is due to elimination of Aircrew Physiology Technology (Project 7755).

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development			
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	86,382	76,102	77,002	Cont
(U) Appropriated Value	89,103	76,102		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reduction	-1,891	-2,641		
b. SBIR	-719	-1,343		
c. Omnibus/Other Above Threshold Reprogrammings				
d. Below Threshold Reprogrammings	4			
e. Rescissions	-93			
(U) Adjustments to Budget Year Since FY 1998 PB			-16,197	
(U) Current Budget Submit/FY 1999 PB	86,404	72,118	60,805	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development				PROJECT 1123				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1123 Manpower, Personnel, and Training				20,139	18,846	14,534	12,275	13,660	12,392	12,754	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops and evaluates new methods and technologies in support of Air Force training and education requirements in a variety of specific areas, including: aircrew training; technical training; medical reserve training; logistics training; training in support of complex decision making; space training; information warfare training; and warfare readiness training. It investigates the spectrum of new and advanced training and education technologies for optimal ways to determine needs and deficiencies, design and implement training, and to evaluate training effectiveness. It develops and evaluates specific training systems, desktop tutors, courseware development tools and technologies, assessment methodologies, and simulation-based systems to determine how to achieve maximum learning effectiveness for specific needs at minimum cost. This project will contribute to a more highly trained and flexible cadre of personnel and reduce the cost of maintaining crew, aircraft, and support personnel readiness. This Applied Research program develops technologies to increase operational readiness by providing more effective methods and approaches to classify, assign, train, assess, and retain personnel. This program focuses on reducing the manpower required to operate and support weapon systems and on improving the effectiveness of the operators, maintainers, and other support personnel for those systems.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 3,547 Developed intelligent/adaptive training and instructional design technologies. <ul style="list-style-type: none"> - (U) Field demonstrated the effectiveness of instructional strategies for automated, intelligent instruction in operational tasks and settings. - (U) Demonstrated effectiveness of automatically generated instructional questions and courseware for Air Force Reserve training. - (U) Completed evaluation of a tool for providing intelligent performance support to novice instructional designers. - (U) Continued to develop and evaluate interactive, multimedia distance learning technologies. - (U) Completed development of adaptive tutor for Undergraduate Navigator Training. - (U) Continued large-scale evaluation of commercially licensed intelligent tutoring systems for fundamental math, English, and science literacy skills. - (U) Completed development and evaluation of desktop training technology for logistics command and control. - (U) Developed training specifications for crypto linguists. - (U) Produced training recommendations for weather forecasting. - (U) \$ 755 Developed adaptive training assessment technologies. <ul style="list-style-type: none"> - (U) Developed and validated criteria to assess the effectiveness and efficiency of intelligent training technologies in operational settings. - (U) Conducted preliminary validation of an integrated education and training assessment framework. 												
Project 1123				Page 3 of 26 Pages				Exhibit R-2 (PE 0602202F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602202F Armstrong Lab Exploratory Development	1123
<ul style="list-style-type: none"> - (U) \$ 8,949 - (U) Transitioned automated tool for determining Air Force training requirements. - (U) Developed individual and team measures of training effectiveness, retention, and decay. - (U) Developed specifications for SynTeam synthetic task environment. Developed concepts, trainers/simulators, and associated technologies to improve Air Force aircrew training. - (U) Developed advanced visualization tools for classroom instruction of basic fighter maneuvers. - (U) Developed metrics of team-oriented situational awareness. - (U) Developed joint-Service team training guidelines for Special Operations Forces aircrew. - (U) Evaluated virtual debrief system for basic fighter maneuver training. - (U) Assessed training value of variable time simulator training on acquisition of combat tasks. - (U) Developed training techniques for Blue Flag Battlestaff exercises. - (U) \$ 1,566 Developed guidelines for fidelity specifications for visual technologies used to improve aircrew training simulators. - (U) Determined training value of eye-position monitoring as visual feedback tool for combat mission training. - (U) Determined effect of field of view of helmet-mounted displays on eye-head movements during a search task. - (U) Developed model of color perception for mesopic (night time) luminance displays. - (U) \$ 2,175 Developed and transitioned technologies to select and classify Air Force personnel and structure DoD jobs to maximize performance and mission accomplishment. - (U) Determined the relationship of individual aptitude and experience to training time and equipment repair time. - (U) Developed personnel decision support system - Personnel Management Information and Support System (PERMISS) module for Permanent Change of Station (PCS) entitlements. - (U) \$ 3,147 Developed technologies to improve assessment of abilities of Air Force personnel. - (U) Developed adaptive and generative tests of abilities to improve precision while decreasing test administration time. - (U) Continued development of data base of specific mental capabilities required for complex, high-technology jobs. - (U) Continued to develop techniques to conduct on-the-job performance assessment. - (U) Completed techniques to measure personality and motivation. - (U) Continued to collect test data to evaluate minority group performance on aircrew selection tests. - (U) Validated crew resource management skills test for selection of C-130 pilots. - (U) Identified ability demands of Joint Primary Aircraft Trainer (JPAT) and Specialized Undergraduate Pilot Training (SUPT). - (U) Developed test battery for Uninhabited Combat Air Vehicle controller selection. - (U) Developed screening systems for selecting weapons directors, navigators, and air traffic controllers. - (U) Developed Uninhabited Air Vehicle (UAV) operator screening assessment tool. - (U) Developed risk-taking assessment device. 		
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BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
**0602202F Armstrong Lab Exploratory
Development**

- (U) \$20,139 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602202F Armstrong Lab Exploratory Development	1123
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 2,791 Continue development of intelligent/adaptive training and instructional design technologies. <ul style="list-style-type: none"> - (U) Continue demonstration of the effectiveness of instructional strategies for automated, intelligent instruction in operational Air Force tasks and settings. - (U) Continue to develop and evaluate interactive, multimedia distance learning technologies. - (U) \$ 630 Continue development of assessment and evaluation technologies for adaptive training. <ul style="list-style-type: none"> - (U) Demonstrate preliminary individual and team retention training and transfer methods. - (U) Develop method for linking individual and team training performance effectiveness to readiness and warfighting capability. - (U) Develop methods for identifying contingency and sustainment training requirements. - (U) Demonstrate automated field performance assessment methods in operational contexts. - (U) Develop adaptive information technologies to support contingency operations. - (U) Develop methods for assessing and integrating tactical information for decision making in high information threat environments. - (U) Develop and test intelligent search engine technologies for information gathering. - (U) \$ 9,840 Continue development of concepts, trainers/simulators, and associated technologies to improve Air Force aircrew training. <ul style="list-style-type: none"> - (U) Conduct simulation-based mission preparation and rehearsal effectiveness assessments. - (U) Determine effects of display disparities on perception of slant and motion. - (U) Develop surface threat visualization trainer. - (U) Demonstrate electronic classroom technology for Specialized Undergraduate Pilot Training (SUPT). - (U) Develop guidelines for information management in a fighter squadron environment. - (U) Use eye tracking technology to assess the impact of alternative training strategies on visual workload for combat mission training. - (U) \$ 1,711 (U) Continue development of technologies to improve assessment of abilities of Air Force personnel. <ul style="list-style-type: none"> - (U) Continue development of database of specific mental abilities required for complex, high technology jobs (Advanced Personnel Test validation). - (U) Continue development of adaptive and generative tests of abilities to improve precision while decreasing test administration time. - (U) Develop and evaluate alternative concepts for measuring ability to perform complex jobs (e.g., Uninhabited Air Vehicle ground controllers under realistic stresses.) - (U) \$ 2,522 Continue to develop and transition technologies to select and classify Air Force personnel and structure DoD jobs to maximize performance and mission accomplishment. <ul style="list-style-type: none"> - (U) Determine entry and career progression job classification standards based on a life cycle approach to job eligibility. - (U) Complete cost/benefit analysis of selected recruiting strategies to meet future demographic trends. - (U) Field test an automated technology to collect individual and organizational productivity data. 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	
		PROJECT 1123
– (U) \$ 1,352	– (U) Deliver crew resource management test to Air National Guard and United States Air Force Reserve. Develop knowledge representation technologies for human performance enhancement.	
	– (U) Develop generalizeable knowledge representation scheme and student modeling module.	
	– (U) Begin development of knowledge-based intelligent computer adaptive instruction authoring system.	
– (U) \$18,846	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$ 3,100	Develop innovative concepts and methods to improve Air Force aircrew training.	
	– (U) Develop guidelines for Special Operations Forces simulation-based mission preparation and rehearsal strategies.	
	– (U) Develop techniques for improved battlestaff training.	
	– (U) Develop instructional scenarios and syllabi for use in multi-participant distributed mission training applications.	
– (U) \$ 3,300	Develop model for the squadron of the future technology, Squadron XXI.	
	– (U) Define the requirements for users at all levels of squadron scheduling (e.g., mission, maintenance, weather, planning).	
	– (U) Define the information management architecture for Squadron XXI.	
	– (U) Evaluate advance tools for information management in the squadron environment.	
– (U) \$ 6,534	Determine visual perceptual requirements for out the window simulator displays.	
	– (U) Determine performance impacts of size constancy difference produced by simulator displays projected at the actual distances versus at optical infinity.	
	– (U) Assess visual display alternatives for multi-place cockpit simulators.	
– (U) \$ 1,600	Develop knowledge representation technologies for human performance enhancement.	
	– (U) Initiate development of knowledge-based technologies for curriculum planning and media selection.	
	– (U) Continue development of knowledge-based intelligent computer adaptive instruction authoring system.	
– (U) \$14,534	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 1123																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">20,211</td> <td style="text-align: center;">19,822</td> <td style="text-align: center;">20,422</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">20,139</td> <td style="text-align: center;">18,846</td> <td style="text-align: center;">14,534</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602233N, Mission Support Technology: Personnel, Training, and Simulation Technology Area. - (U) PE 0602716A, Human Factors Engineering Technology Development. - (U) PE 0602727A, Non-System Training Devices Technology. - (U) PE 0602785A, Manpower, Personnel, and Training Technology. - (U) PE 0603106F, Logistics Systems Technology. - (U) PE 0603227F, Personnel, Training, and Simulation Technology. - (U) PE 0604227F, Flight Simulator Development. - (U) PE 0604243F, Manpower, Personnel, and Training Development. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	20,211	19,822	20,422	Cont	(U) Current Budget Submit/FY 1999 PB	20,139	18,846	14,534	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	20,211	19,822	20,422	Cont														
(U) Current Budget Submit/FY 1999 PB	20,139	18,846	14,534	Cont														
Project 1123	Page 7 of 26 Pages	Exhibit R-2 (PE 0602202F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development				PROJECT 1710				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1710 Logistics Technology				5,875	5,060	3,365	3,057	3,194	3,236	3,360	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: This project develops technologies to: improve logistics support for both combat and peacetime operations; enhance logistics planning and assessment models for realistic wartime and contingency operations; improve logistics support requirements trade off and design methods to reduce manpower and equipment needed to support logistics operations in dispersed locations; and develop software tools for use in designing improved reliability, maintainability, supportability, and man-machine interfaces to reduce life cycle costs and increase system affordability of aging aircraft and new weapon systems.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,410 Continued development of technology for improved contingency logistics planning, deployment, support equipment functional upgrades. - (U) \$1,058 Evaluated alternatives for visual display and assessment of complex logistics control and planning data. - (U) \$3,407 Researched and identified user-driven reliability, maintainability, and functional requirements to improve the deployability and operational capability of aircraft ground support equipment. - (U) \$5,875 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,620 Develop and compare technologies to support more flexible and less costly deployment and maintenance of airlift and combat aircraft. - (U) Research text and graphic displays, synthesis, and presentation methods to improve human comprehension of complex resource allocation tasks, enhancing wing readiness, distributed logistics mission training, logistics planning, deployment, and combat capability. - (U) \$ 505 Continue development of portable "wearable" logistics visualization devices and logistics information integration, command and control systems. - (U) Develop advanced visualization, option generation, and logistics command and control tools for deployment planning and execution - (U) \$2,935 Develop software tools and architectures that add high levels of intelligence to logistics information system interfaces and databases, for more effective use in rapid-response contingency and deployed operations. - (U) \$5,060 Total 												
Project 1710				Page 8 of 26 Pages				Exhibit R-2 (PE 0602202F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 1710
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,421 Continue development of technologies to reduce the cost and improve the performance of aircraft maintenance and increase flexibility/reduce costs of sustainment, deployment, and operations. (U) Develop and evaluate technologies for use in logistics command and control environments of the future. - (U) \$ 472 Evaluate and compare presentation technologies for improving supportability assessment and logistics command and control. (U) Conduct initial in-house demonstrations and preliminary user assessments of correlated cueing techniques for assessing logistics deployment readiness. - (U) \$ 472 Define and evaluate advanced knowledge representation schemes and computational linguistics methods to automatically extract maintenance manual information directly from for weapon systems design data. - (U) \$3,365 Total 		
Project 1710	Page 9 of 26 Pages	Exhibit R-2 (PE 0602202F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 1710																
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	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	5,882	5,308	5,539	Cont														
(U) Current Budget Submit/FY 1999 PB	5,875	5,060	3,365	Cont														
Project 1710	Page 10 of 26 Pages	Exhibit R-2 (PE 0602202F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development				PROJECT 1900				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1900 Environmental Quality Technology				9,651	4,248	3,807	3,045	1,097	1,756	0	0	Continuing

(U) **A. Mission Description and Budget Item Justification:** This project develops technologies to characterize the chemistry of Air Force-generated pollutants and toxic materials, assesses their interaction with the environment, and develops reduction/destruction and control techniques. Efforts are conducted to reduce the cost and increase the effectiveness of technologies that protect the environment. New Air Force fuels and chemicals are analyzed to identify and prevent possible environmental problems. Materials are investigated and new processes explored to assess and reduce environmental risks. Novel monitoring and modeling technologies are also explored.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,642 Developed technologies and design criteria for improved monitoring, characterization, and assessment of risks to the environment posed by Air Force activities.
 - (U) Characterized the fate and transport characteristics of Dense Nonaqueous Phase Liquids (DNAPLs) in soils and groundwater using physical model studies to validate and develop models to determine the best effects of physical, chemical, and biological processes to degrade contaminants.
 - (U) Identified and resolved environmental and operational safety issues for Large-Scale Chemical Laser (LSCL) systems.
 - (U) Determined the atmospheric chemistry of candidate and new Air Force fuels and chemicals; developed a database of the rates of photochemical and dark reactions of Air Force organic solvent vapors, new fire extinguishants, and new fuels in the presence of specific air pollutants.
- (U) \$4,009 Developed technologies to reduce wastes and contamination of the environment caused by Air Force materials and operations.
 - (U) Investigated, selected, and tested several novel technologies to remove emulsified oil and suspended particulates from oil-water separator effluents and aqueous cleaning/degreasing tanks.
 - (U) Developed affordable technologies to control air polluting emissions from Air Force industrial processes to comply with Clean Air Act Amendments; developed pulsed corona reactor technology for jet engine test cells.
- (U) \$3,000 Developed technologies to destroy wastes and contamination of the environment caused by Air Force materials and operations.
 - (U) Developed innovative technologies to treat/recycle metal/halogen contaminated sludge and other hazardous wastes from Air Force industrial operations to reduce disposal/recycle costs and comply with regulatory standards.
 - (U) Developed chemical reactors to convert liquid wastes and energetic materials to non-hazardous products and to treat other complex chemical waste effluents.
- (U) \$9,651 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 1900
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>– (U) \$ 885 Develop technologies and design criteria for improved monitoring, characterization, and assessment of risks to the environment posed by Air Force activities. <li>– (U) Continue to determine the atmospheric chemistry of candidate and new Air Force fuels and chemicals; develop a database of the rates of photochemical and dark reactions of Air Force solvent vapors, new fire extinguishants, and new fuels in the presence of specific air pollutants. <li>– (U) Continue to identify and resolve the environmental and operational safety issues for Large-Scale Chemical Laser (LSCL) systems. <li>– (U) Complete natural attenuation study to prove that natural biodegradation of hydrocarbon contaminants is an acceptable method of treatment. <li>– (U) Develop space launch risk assessment model to assess the fate and transport of toxic emissions in catastrophic aborts. <li> <ul style="list-style-type: none"> <li>– (U) \$1,814 Develop technologies to reduce wastes and contamination of the environment by Air Force materials and operations. <li>– (U) Develop affordable technology to control air polluting emissions from Air Force industrial processes to comply with Clean Air Act Amendments. <li> <ul style="list-style-type: none"> <li>– (U) \$1,549 Develop technologies to destroy wastes and contamination of the environment by Air Force materials and operations. <li>– (U) Develop chemical reactors to convert liquid wastes and energetic materials to non-hazardous products and to treat other complex chemical wastes. <li> <ul style="list-style-type: none"> <li>– (U) \$4,248 Total 		
Project 1900	Page 12 of 26 Pages	Exhibit R-2 (PE 0602202F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 1900
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li>– (U) \$1,428 Develop technologies and design criteria for improved monitoring, characterization, and assessment of risks to the environment posed by Air Force activities. <ul style="list-style-type: none"> <li>– (U) Continue to determine the atmospheric chemistry of candidate and new Air Force fuels and chemicals; develop an experimental database for gas-phase reactions of new Air Force industrial solvents, fire extinguishing agents, and halons in the presence of targeted air pollutants. <li>– (U) \$ 500 Develop technologies to reduce wastes and contamination of the environment by Air Force materials and operations. <ul style="list-style-type: none"> <li>– (U) Develop affordable technology for control of air polluting emissions from Air Force industrial processes to comply with Clean Air Act Amendments. <li>– (U) \$1,879 Develop technologies to destroy wastes and contamination of the environment by Air Force materials and operations. <ul style="list-style-type: none"> <li>– (U) Develop chemical reactors to convert liquid wastes and energetic materials to non-hazardous products and to treat other complex chemical wastes. <li>– (U) Develop and identify novel strategies for biosynthesis and biodegradation of DoD materials and chemicals. <li>– (U) \$3,807 Total 		
Project 1900	<i>Page 13 of 26 Pages</i>	Exhibit R-2 (PE 0602202F)

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 1900																
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	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>														
(U) Previous President's Budget (FY 1998 PB)	9,661	4,534	5,827	Cont														
(U) Current Budget Submit/FY 1999 PB	9,651	4,248	3,807	0														
Project 1900	<i>Page 14 of 26 Pages</i>		Exhibit R-2 (PE 0602202F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development				PROJECT 7184		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
7184	Crew Technology	30,337	25,435	26,395	27,625	28,029	25,837	27,104	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops the technology required to improve human performance, protection, and survivability in operational environments. This is accomplished by defining the physical parameters, capabilities, and limits of systems operators; determining human responses to operational stresses such as noise, impact, vibration, hostile fire, sustained acceleration, spatial disorientation, altitude, workload, and sustained operations; and optimizing the human-machine interface. The project produces human factors design criteria, guidelines, and automated design tools for the development of effective technologies for information display, team communications, crew scheduling and fatigue management, control interfaces, emergency escape, crash protection, acceleration protection, and aircrew life support.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 2,002 Developed unobtrusive, reliable predictors of human systems effectiveness. <ul style="list-style-type: none"> - (U) Developed an analytical description of crew performance in Theater Missile Defense attack operations simulation. - (U) Integrated memory probes, attention allocation, and other mental components for inclusion into an overall situation awareness conceptual model. - (U) \$ 5,545 Developed system design technologies for greater integration of human performance data and improved collaborative system interfaces. <ul style="list-style-type: none"> - (U) Completed software to collect and reduce data for whole body, three-dimensional anthropometric scanning system. - (U) Demonstrated analytical methodology for cognitive engineering in support of information dominance. - (U) \$ 7,857 Developed visual displays and symbology technology for improved human-machine interfaces and demonstrated virtual cockpit technology. <ul style="list-style-type: none"> - (U) Evaluated wide field-of-view, ejection-safe night vision goggle technology. - (U) Demonstrated integrated virtual cockpit technology for improved air-to-air engagement performance. - (U) Prototyped ruggedized miniature-image display electronics and helmet-vehicle interface (HVI) analyzer for flight demonstration. - (U) Developed binocular helmet-mounted sight/display (HMS/D) specifications and test standards. - (U) \$ 4,349 Developed injury criteria and technology for improved aircrew and support personnel protection equipment. <ul style="list-style-type: none"> - (U) Evaluated accommodation criteria for through-the-canopy impact and extremity clearance for aircraft training systems. - (U) Developed combined crew member/ejection seat model. - (U) Compared multimedia work technologies for use by engineers to evaluate concepts for aircrew protection. - (U) Developed neck injury probability assessment methodology using experimental and operational data. 										
Project 7184		Page 15 of 26 Pages				Exhibit R-2 (PE 0602202F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 7184
<ul style="list-style-type: none"> - (U) \$ 2,900 - (U) \$ 3,056 - (U) \$ 4,628 - (U) \$30,337 	<ul style="list-style-type: none"> Developed technologies to measure and predict the effects of human auditory responses and to provide criteria for voice communication for selected Air Force weapon systems and base operations. <ul style="list-style-type: none"> - (U) Developed, demonstrated, and transitioned audio performance measurement technologies for assessment of individual auditory localization ability in operational situations. - (U) Developed advanced models, criteria, and technologies for improving human audio communication for Air Force weapon systems and for degrading communications capabilities of opposing forces. Developed technologies for evaluating and improving personal protection and effectiveness of aircrew and support personnel operating in hazardous environments. <ul style="list-style-type: none"> - (U) Developed and evaluated technologies to protect aircrew and enhance performance in the high-G environment. - (U) Defined risk and demonstrated countermeasures to high altitude physiology risk in reconnaissance operations. Developed technologies for sustained aircrew operations and integration of life support technologies into aircraft to improve aircrew safety and performance. <ul style="list-style-type: none"> - (U) Demonstrated fitness-for-duty performance metrics and team decision making strategies for enhanced performance in long-duration missions. - (U) Initiated research on ceramic oxygen generation technology for aircraft and field hospital applications. - (U) Developed and transitioned advanced spatial disorientation technologies and countermeasures for aircrew. Total 	
(U) FY 1998 (\$ in Thousands):		
<ul style="list-style-type: none"> - (U) \$ 1,787 - (U) \$ 4,654 - (U) \$ 6,531 	<ul style="list-style-type: none"> Continue to develop unobtrusive, reliable predictors of human systems effectiveness. <ul style="list-style-type: none"> - (U) Develop a computer-based model of workload and situation awareness for crew performance in Theater Missile Defense attack operations mission. - (U) Develop an overall situation awareness model by including integration of memory probes, attention allocation, and other mental components. - (U) Integrate psychophysical and performance metrics into an on-line workload classifier. Continue to develop system design technologies for improved integration of human performance data and collaborative system interfaces. <ul style="list-style-type: none"> - (U) Complete first whole-body, three-dimensional anthropometric survey. - (U) Complete prototype of expert computer-aided design (CAD) program incorporating crew station design guidelines. - (U) Demonstrate DoD-common surveillance automatic target recognizer workstation integration. Continue to develop visual displays and symbology technology for improved human-machine interfaces and demonstrate sensor-augmented cockpit technology for spaceplane or synthetic vision applications. <ul style="list-style-type: none"> - (U) Develop baseline performance need for next generation sighting system. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	
	<p align="right">PROJECT 7184</p> <ul style="list-style-type: none"> - (U) Develop flat cathode ray tube and hybrid optics for advanced helmet-mounted sight/display. - (U) Develop visual requirements for on-board sensor processing. - (U) Demonstrate multi-sensory, virtual air-to-air and air-to-ground cockpit design principles. - (U) Develop ejection-safe, panoramic night vision goggle with integrated display. - (U) Develop standardized test methods for night vision devices and transparencies. - (U) \$ 3,205 Continue to develop injury criteria and technology for improved aircrew and support personnel protection equipment. - (U) Formulate modeling technology to assess combined coupling aerodynamic and inertial forces on the head and neck during high-speed escape. - (U) Validate performance of integrated ejection seat and human dynamics models. - (U) Develop hardware and software specifications for a suite of simulation tools for human modeling in dynamic environments. - (U) Complete Head-Spine Model (Personal Computer Version). - (U) \$ 2,900 Continue to develop improved aural technologies for enhanced human-system interface, develop technologies to measure and predict the effects of human auditory responses, and provide voice communication criteria for selected Air Force weapon systems and base operations. - (U) Develop, demonstrate, and integrate three-dimensional audio technology applications for air- and ground-based command, control, and communications. - (U) Continue integration of auditory and visual display technologies and symbologies for air-to-air, air-to-ground, and ground applications. - (U) Develop and demonstrate auditory localization screening test methodology and hardware for improved personnel performance/safety. - (U) Continue development of advanced models, criteria, and technologies for improving human audio communication for Air Force weapon systems and for degrading communications capabilities of opposing forces. - (U) Develop smaller and more economical advanced spatial audio system technologies. - (U) \$ 2,232 Continue to develop technologies for evaluating and improving aircrew protection and effectiveness in operational environments. - (U) Determine the effect of multi-axis accelerations on aircrew piloting performance. - (U) Develop physical conditioning dietary regimens to enhance G-tolerance and reduce fatigue for aircrews. - (U) Continue development of life support and high altitude protection technologies. - (U) \$ 4,126 Continue to develop technologies for sustained aircrew operations and integration of life support technologies into aircraft to improve aircrew safety and performance. - (U) Develop and demonstrate fatigue models and incorporate into campaign-level models for aircrew sustained operations. - (U) Develop in-flight spatial disorientation (SD) training technologies for non-mishap SD information and mishap consultation data. - (U) Continue research on ceramic oxygen generation technology for aircraft and field hospital applications. - (U) Determine psychophysiological constraints of helmet-mounted display/symbology. 	
Project 7184	Page 17 of 26 Pages	Exhibit R-2 (PE 0602202F)

		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	
- (U) \$25,435 Total		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research •	0602202F Armstrong Lab Exploratory Development	7184
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$ 2,160 Continue to develop unobtrusive, reliable predictors of human system effectiveness. <ul style="list-style-type: none"> – (U) Apply computer model of workload and situation awareness to design evaluation of controls and displays for Theater Missile Defense attack operations mission. – (U) Complete development of a single crewman situation awareness model. – (U) Refine and evaluate on-line workload classifier for inclusion in a real-time operator workload evaluator. – (U) \$ 5,973 Continue to develop system design technologies for greater integration of human performance data and improved collaborative systems interfaces. <ul style="list-style-type: none"> – (U) Develop a fully integrated, on-line data system to serve as an international resource for human anthropometric data and applications software. – (U) Develop a computer-aided design (CAD) tool that accurately represents the human body as a software template in the interactive CAD environment. – (U) Demonstrate models and metrics for distributive situational awareness and adaptive decision-making. – (U) Demonstrate human-aiding network software to streamline the sharing, synchronization, and analysis of operational mission data among intelligence analyst and command centers. – (U) \$ 8,037 Continue to develop visual displays and symbology technology for improved human-machine interfaces and demonstrate adaptive interface technology. <ul style="list-style-type: none"> – (U) Develop integrated display and information processing standards for targeting helmet-mounted sight/display. – (U) Develop design alternatives for lightweight integrated helmet-mounted display and sighting system using eye line-of-sight. – (U) Develop ejection-safe, panoramic night vision goggle with integrated external sensor input for night operations. – (U) Demonstrate a pilot-vehicle interface whose functionality changes with pilot physiologic and behavioral states driven by the combat situation. – (U) \$ 3,889 Continue to develop injury criteria and technology for improved aircrew and support personnel protective equipment. <ul style="list-style-type: none"> – (U) Validate airbag/occupant model versus impact test data for potential application to air vehicles. – (U) Develop, as part of the Biodynamic Work Environment, a common Biodynamic Data Bank Format and User Interface for DoD, the National Highway Transportation Safety Administration, and the Federal Aviation Administration. – (U) Develop stability criteria for helmet-mounted displays in a vibration or multiple impact environment. – (U) \$ 3,801 Continue expansion of advanced aural technologies for enhanced human systems interfaces; establish new principles and methodologies of information management for exploitation of information warfare applications. <ul style="list-style-type: none"> – (U) Evaluate and apply three-dimensional audio technologies for operator intensive applications in special uninhabited air vehicle and command, control, and communications functions using smaller, cost-effective auditory/visual displays and customized symbology. 		
Project 7184	Page 18 of 26 Pages	Exhibit R-2 (PE 0602202F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	
		PROJECT 7184
<ul style="list-style-type: none"> - (U) \$ 2,435 - (U) \$ 100 - (U) \$26,395 	<ul style="list-style-type: none"> - (U) Advance methodologies and technologies for quantifying individual auditory localization ability of operational personnel in combat and occupational positions. - (U) Develop and demonstrate novel voice modification and intelligent jammer technologies for enhanced information warfare operations. Continue to develop distributed mission training technologies that enhance aerial combat performance during sustained operations. - (U) Improve integrated mission rehearsal training technologies for aircrew and battle staff in simulated and field sustained operations. Support the joint Air Force/Defense Advanced Research Projects Agency Unmanned Combat Air Vehicle (UCAV) program. Total 	
Project 7184	<i>Page 19 of 26 Pages</i>	Exhibit R-2 (PE 0602202F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development				PROJECT 7755	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
7755 Aircrew Physiology Technology	6,481	4,496	0	0	0	0	0	0	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> The human operator is the enabling factor in aerospace systems. The goal of this project is to optimize aircrew effectiveness by developing an understanding of: (1) conditions affecting aircrew selection and retention; (2) methods of early disease detection; (3) impact of asymptomatic disease on aircrew performance; (4) therapeutic drug effects on flight safety; and (5) physiological factors affecting operational readiness and effectiveness.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,702 Developed technologies for improving aircrew standards. <ul style="list-style-type: none"> - (U) Continued to refine standards (i.e., cardiovascular, vision/optical devices, neuropsychiatric, and hearing/vestibular standards) to improve aircrew selection, retention, and performance. - (U) Developed medical informational technology to assess impact of asymptomatic disease on aircrew operational performance. - (U) Developed and validated operational cockpit glare testing technology. - (U) Assessed physiological factors affecting female aircrew (i.e., ob-gyn, orthopedic, G-tolerance) performance. - (U) Developed template for therapeutic modalities to reduce number of grounded aviators and to enhance performance in the aviation environment. - (U) \$1,379 Developed operational performance enhancement technologies. <ul style="list-style-type: none"> - (U) Compared advanced operational vision performance technologies (e.g., refractive surgery for aircrew use). - (U) Developed methods to identify and remediate physiological impairments arising from flying high performance aircraft. - (U) \$1,400 Developed technologies to improve quality and efficiency of aircrew operational evaluations. - (U) \$6,481 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,116 Develop operational performance enhancement technologies. <ul style="list-style-type: none"> - (U) Develop and evaluate aircrew vision enhancement technologies for both day and night air combat. - (U) Develop methods to identify and remediate physiological impairments arising from flying high performance aircraft. - (U) \$ 265 Conduct and complete expanded physical fitness test battery. - (U) \$ 115 Conduct and complete fire fighter physical fitness program. - (U) \$4,496 Total 									
Project 7755			Page 21 of 26 Pages				Exhibit R-2 (PE 0602202F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998																				
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 7755																					
<p>(U) <u>FY 1999</u>: Not Applicable.</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;">Total</th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">6,488</td> <td style="text-align: center;">4,717</td> <td style="text-align: center;">4,590</td> <td style="text-align: center;"><u>Cost</u></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">6,481</td> <td style="text-align: center;">4,496</td> <td style="text-align: center;">0</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">0</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program. In FY 1999, this project has been eliminated.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0603231F, Crew Systems and Personnel Protection Technology. - (U) PE 0604703F, Aeromedical/Casualty Care Systems Development. - (U) PE 0604706F, Life Support Systems. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total	(U) Previous President's Budget (FY 1998 PB)	6,488	4,717	4,590	<u>Cost</u>	(U) Current Budget Submit/FY 1999 PB	6,481	4,496	0	Cont					0
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total																			
(U) Previous President's Budget (FY 1998 PB)	6,488	4,717	4,590	<u>Cost</u>																			
(U) Current Budget Submit/FY 1999 PB	6,481	4,496	0	Cont																			
				0																			
Project 7755	Page 22 of 26 Pages	Exhibit R-2 (PE 0602202F)																					

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development			PROJECT 7757			
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
7757 Toxicology/Radiation/Noise Hazards	13,921	14,033	12,704	9,800	11,681	10,976	10,201	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project enables the safe operational use of Air Force weapon systems through technology development related to the effects and applications of hazardous materials, noise, and electromagnetic and space radiation used in, or resulting from, Air Force operations. The radiation portion of the project addresses areas such as: safety; risk assessment; mission planning and countermeasures in combat; less than lethal applications for special operations and law enforcement; and biologic effects of exposure to radiofrequency/microwave radiation, lasers, broad-band munitions, and ionizing radiation. Toxicological technology is developed to assess human tolerance levels for chemicals, fuels, and materials to establish exposure criteria and perform trade off analyses between weapon system performance and occupational health and environmental support specifications. Technology to assess and reduce the environmental impact of noise generated by Air Force operations is also developed. This project provides consultative support to other DoD programs by using unique Air Force resources to extend capabilities for development and evaluation of technology to assess and counter toxicological, radiation, and noise hazards.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$8,310 Developed technology to exploit the effects and applications of directed energy in Air Force operations. <ul style="list-style-type: none"> - (U) Produced interim ultra-short pulse laser safety standard and continued developing technology to assess occupational safety and operational threats from lasers. - (U) Continued developing electromagnetic radiation bioeffects measurement and analysis methods for use in setting risk-based health and safety standards for personnel exposure. - (U) Continued developing technologies for assessing bioeffects of less-than-lethal directed energy emissions. - (U) Developed analytical algorithms for calculating and predicting direct and inverse scattering of laser and radiofrequency radiation. - (U) \$4,925 Developed and assessed toxicological technology related to Air Force materials and processes. <ul style="list-style-type: none"> - (U) Continued toxicological assessment of next generation replacements for Halons and ozone depleting solvents to protect Air Force personnel and provide systems managers with risk versus benefit decision tools. - (U) Continued to develop and improve methods and models to assess chemical mixture toxicity in humans, relate human health effects to cleanup standards, and explore indicators of exposure. - (U) Continued development of metabolic techniques for cell culture exposure, species extrapolation for enzymes diversity, and suitable alternatives to animal use for transition to operational toxicology applications. - (U) Provided systems managers with critical information for risk versus benefits decision for toxicity of turbine engine exhaust and JP-8 jet fuel. 										
Project 7757			Page 23 of 26 Pages				Exhibit R-2 (PE 0602202F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	
		PROJECT 7757
– (U) \$ 686	Developed technology to assess and reduce adverse impacts of aircraft noise and sonic booms produced by Air Force operations.	
	– (U) Conducted noise measurements on the F-22 aircraft.	
	– (U) Developed model to predict damage from sonic booms on historic structures.	
	– (U) Developed technology to assess human annoyance response to sonic booms and low level aircraft overflights.	
– (U) \$13,921	Total	
(U) FY 1998 (\$ in Thousands):		
– (U) \$ 8,258	Develop technology to exploit the effects and applications of directed energy in Air Force operations.	
	– (U) Initiate probabilistic risk approach to safety for High-Energy Laser Systems.	
	– (U) Develop electromagnetic radiation bioeffects assessment tools for use in setting scientifically-based health and safety standards for personnel exposure; complete long-term study on ultrawideband exposure and millimeter wave health and safety.	
	– (U) Develop technologies for assessing health and safety risks of less-than-lethal directed energy emissions.	
	– (U) Develop algorithms for assessing bioeffects of exposure to electromagnetic radiation.	
– (U) \$ 5,025	Develop and assess toxicological technology related to Air Force materials and processes.	
	– (U) Continue to develop toxicological assessments for the ultimate Halon replacements and non-ozone depleting alternative solvents.	
	– (U) Assess the potential hazards and occupational safety of fuels such as JP-8 and JP-8 + 100.	
	– (U) Develop methodology for extrapolation of chronic exposure data to Short-Term Exposure Limits (STELs).	
	– (U) Provide program managers with human health-based data to conduct chemical specific risk assessments.	
– (U) \$ 750	Develop technology to assess and reduce adverse impacts of aircraft noise and sonic booms produced by Air Force operations.	
	– (U) Demonstrate miniaturized boom monitor that will cut monitoring costs by 80 percent.	
	– (U) Conduct joint study with Navy to model noise propagation over water.	
	– (U) Demonstrate radar tracking storage technology for noise analysis.	
– (U) \$14,033	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 7757
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$ 4,433 Develop technology to counter laser threats to combat forces and exploit optical systems in Air Force operations. <ul style="list-style-type: none"> – (U) Develop risk-based laser safety policy required to support operations. – (U) Asses developmental reflective aircrew laser eye protection for safe-to-fly and cockpit compatibility requirements. – (U) Refine joint-Service personnel effects models to assess combatant vulnerability to emerging optical threats. – (U) Develop guidelines required to deploy non-lethal optical technologies. – (U) Evaluate Photorefractive Keratectomy (PRK) as surgical method used on aircrew to reduce need for glasses or contact lenses. – (U) \$ 5,871 Evaluate and exploit the bioeffects of radio frequency radiation (RFR) for military applications. <ul style="list-style-type: none"> – (U) Asses the validity of effects and health issues of RFR non-lethal weapons to assure their operational utility, technical feasibility, and policy approval. – (U) Issue revised safety guidelines for RFR to support fielding of high-power microwave (HPM) and ultrawideband (UWB) weapons. – (U) Transition advanced dosimetry tools to support all military RFR applications (e.g., radar, communications, directed energy weapons), including revolutionary RFR personnel dosimeter for both safety and threat assessments. – (U) Apply core competencies in biological mechanistic analysis and electromagnetic bioeffects modeling to discover, develop, and transition new military uses of electromagnetic energy. – (U) \$ 200 Continue development of technology to assess and reduce adverse impacts of aircraft noise and sonic booms produced by Air Force operations. <ul style="list-style-type: none"> – (U) Conduct sensor integration and field testing for remote area monitoring (RAM) system. – (U) \$ 2,200 Develop and assess deployment toxicology technologies to support Air Force materials and processes. <ul style="list-style-type: none"> – (U) Analyze relevant and valid biological markers that indicate possible hazardous chemical exposure to military personnel in a deployment location. – (U) Develop mathematical predictive tools that accurately describe the human body burden and health implications resulting from operationally relevant single and multiple chemical exposures. – (U) Develop and validate chemical exposure effects that degrade a military members’s ability to perform the mission. – (U) Assess simulation model for determining operational impact of environmental chemical exposures on fixed base operations. – (U) \$12,704 Total 		
Project 7757	Page 25 of 26 Pages	Exhibit R-2 (PE 0602202F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602202F Armstrong Lab Exploratory Development	PROJECT 7757																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">13,936</td> <td style="text-align: center;">14,751</td> <td style="text-align: center;">14,443</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">13,921</td> <td style="text-align: center;">14,033</td> <td style="text-align: center;">12,704</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602720A, Environmental Quality Technology. - (U) PE 0602777A, Systems Health Hazard Prevention Technology. - (U) PE 0603231F, Crew Systems and Personnel Protection Technology. - (U) PE 0604706F, Life Support Systems. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	13,936	14,751	14,443	Cont	(U) Current Budget Submit/FY 1999 PB	13,921	14,033	12,704	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	13,936	14,751	14,443	Cont														
(U) Current Budget Submit/FY 1999 PB	13,921	14,033	12,704	Cont														
Project 7757	Page 26 of 26 Pages	Exhibit R-2 (PE 0602202F)																

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	68,860	57,261	69,061	70,539	73,303	74,520	77,897	Continuing	Continuing
3012 Advanced Propulsion Technology	6,869	0	1,961	1,952	1,945	1,936	1,927	Continuing	Continuing
3048 Fuels and Lubrication	11,785	10,923	11,790	11,799	12,702	14,100	14,372	Continuing	Continuing
3066 Turbine Engine Technology	36,391	31,998	40,745	42,194	42,870	43,241	45,441	Continuing	Continuing
3145 Aerospace Power Technology	13,815	14,340	14,565	14,594	15,786	15,243	16,157	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: As of FY 1998, all ramjet high-speed propulsion efforts under Project 3012, Advanced Propulsion Technology, were terminated, but studies in combined and advanced cycle engines will be continued in FY 1999 and out.

(U) A. Mission Description and Budget Item Justification: This Applied Research program develops airbreathing propulsion and aerospace power technologies. The prime areas of focus are turbine engines, dual-mode ramjets, combined cycle engines, fuels, lubricants, and aerospace power technologies. Technology advances in turbine engine propulsion and lubrication systems are part of the Integrated High Performance Turbine Engine Technology (IHPTET) program and will increase engine performance, increase reliability, reduce specific fuel consumption, and lower cost of ownership. Dual-mode ramjet and combined cycle engines will increase weapon lethality and effectiveness against time-critical targets via high-speed propulsion systems. Fuels efforts will reduce system cost, maintenance, and the usage of hazardous cleaning materials while increasing aircraft performance and life through development of thermally stable and high heat sink fuels. High heat sink fuels from coal-derived resources will be investigated. Power system technologies are focused to eliminate troublesome, centralized hydraulic systems by replacement with highly reliable electric systems. Power conditioning, thermal management, and battery improvements will significantly enhance reliability, reduce weight, and lower life cycle costs

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 2 - Applied Research		PE NUMBER AND TITLE 0602203F Aerospace Propulsion		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	72,221	69,303	68,416	Cont
(U) Appropriated Value	74,906	60,577		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,576	-2,389		
b. SBIR	-975	-927		
c. Other Adjustments	-3,412			
d. Below Threshold Reprogrammings	-5			
e. Rescissions	-78			
(U) Adjustments to Budget Year Since FY 1998 PB			645	
(U) Current Budget Submit/FY 1999 PB	68,860	57,261	69,061	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to changing priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion	PROJECT 3012
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3012 Advanced Propulsion Technology	6,869	0	1,961	1,952	1,945	1,936	1,927	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification:** Establishes the technology base for advanced propulsion concepts including integral rocket ramjets for missile propulsion providing increased average velocity and lethality along with combined/advanced-cycle engines and hydrocarbon fueled dual-mode combustion ramjets for high-speed vehicles to support future missions such as rapid strike against time-critical targets. Note: This project was reduced to zero in FY 1998; however, the Air Force reinstated funding in FY 1999 and out and plans to reprogram funds into the project in FY 1998.

(U) **FY 1997 (\$ in Thousands):**

- (U) \$1,817 Developed propulsion system components (inlets, ramburners, nozzles, inlet/port covers, boost motors, etc.) for high-speed airbreathing propulsion applications. This effort facilitates technology transition to current and future air vehicles with greater range, increased velocity, and increased maneuverability which enhance weapon effectiveness.
 - (U) Completed testing of full-scale lightweight consumable structures for eliminating debris during rocket/ramjet transition.
 - (U) Determined applicability and quantified benefits of advanced ramjet propulsion technologies (insensitive munitions, low-observables, self throttling, high energy fuels, structures, etc.) for ramjet operation from launch condition through Mach 6 operation.
 - (U) Tested a boilerplate pulse detonation engine operating at realistic frequencies, thrust levels, and for sufficient time to demonstrate cycle performance.
- (U) \$2,211 Investigated advanced concepts and develop engine components (dual-mode combustors, fuel injectors, flameholding systems, etc.) for supersonic combustion ramjet (scramjet) applications. This effort supports technology transition for next generation hypersonic missiles and air vehicles to provide greater range and increased velocity which enhance weapon effectiveness.
 - (U) Determined propulsion performance of dual-mode ramjet components utilizing advanced test technologies, instrumentation, and diagnostics.
 - (U) Investigated, further developed, and exploited Russian hypersonic technology.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion PROJECT 3012	
<ul style="list-style-type: none"> - (U) \$2,841 	<p>Investigated unique concepts for combining advanced propulsion cycles which provide the capability for takeoff, acceleration, cruise, and target loiter for high-speed aerospace vehicles. This effort supports technology transition for next generation reconnaissance/strike vehicles (manned and unmanned) and airbreathing boosters.</p> <ul style="list-style-type: none"> - (U) Completed fabrication and initiated testing of annular sector test rig to demonstrate performance of critical combustor components for application to Mach 0-6 turboramjet engines. - (U) Completed conceptual design of combined cycle engine demonstrator. - (U) Tested a boilerplate pulse detonation engine operating at realistic frequencies, thrust levels, and for sufficient time to demonstrate cycle performance. 	
<ul style="list-style-type: none"> - (U) \$6,869 	<p>Total</p>	
<p>(U) <u>FY 1998</u>: Not Applicable.</p>		
<p>(U) <u>FY 1999 (\$ in Thousands)</u>:</p>		
<ul style="list-style-type: none"> - (U) \$729 	<p>Investigate unique concepts for combining advanced propulsion cycles which provide the capability for takeoff, acceleration, cruise, and target loiter for high-speed aerospace vehicles. This effort supports technology transition for next generation reconnaissance/strike vehicles (manned and unmanned) and airbreathing boosters.</p> <ul style="list-style-type: none"> - (U) Conduct airbreathing propulsion support study for advanced dual-range missile to potentially increase range. - (U) Conduct combined cycle engine trade studies for aircraft, missile, and spacelift applications to determine potential areas for future investment. 	
<ul style="list-style-type: none"> - (U) \$396 	<p>Investigate, further develop, and exploit Russian hypersonic technology. This effort supports technology transition for next generation hypersonic missiles and air vehicles to provide greater range and increased velocity which enhance weapon effectiveness.</p> <ul style="list-style-type: none"> - Exploit plasma effects to reduce engine drag and enhance combustion initiation. - Conduct investigation of magnetohydrodynamic flow acceleration to enhance scramjet thrust generation. - Exploit Russian advances in endothermic fuels to provide high Mach operation using conventional jet fuel. 	
<ul style="list-style-type: none"> - (U) \$836 	<p>Investigate unique pulse detonation engine concepts to provide the capability for takeoff, acceleration, cruise, and target loiter for high-speed aerospace vehicles. This effort supports technology transition for next generation reconnaissance/strike vehicles (manned and unmanned) and airbreathing boosters.</p> <ul style="list-style-type: none"> - (U) Conduct Pulse Detonation Engine (PDE) experiments and trade studies to optimize PDE performance to provide lower cost , higher performance alternative to turbine engines for expendable weapon applications. - (U) Investigate potential for combining airbreathing and rocket pulse detonation engines to provide lower cost access to space. 	
<ul style="list-style-type: none"> - (U) \$1,961 	<p>Total</p>	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion	PROJECT 3012															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">7,179</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">6,869</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1,961</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to emphasis on Advanced Propulsion technologies within the Science and Technology (S&T) Program. Note: This project was reduced to zero in FY 1998; however, the Air Force reinstated funding in FY 1999 and out and plans to reprogram funds into the project in FY 1998.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0603216F, Aerospace Propulsion and Power Technology. - (U) Program is reported to/coordinated by the Joint Army/Navy/NASA/Air Force (JANNAF) executive committee. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	7,179	0	0	Cont	(U) Current Budget Submit/FY 1999 PB	6,869	0	1,961	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>													
(U) Previous President's Budget (FY 1998 PB)	7,179	0	0	Cont													
(U) Current Budget Submit/FY 1999 PB	6,869	0	1,961	Cont													
Project 3012	Page 5 of 16 Pages	Exhibit R-2 (PE 0602203F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 2 - Applied Research			PE NUMBER AND TITLE 0602203F Aerospace Propulsion					PROJECT 3048			
COST (\$ In Thousands)			FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3048	Fuels and Lubrication		11,785	10,923	11,790	11,799	12,702	14,100	14,372	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: Develops advanced fuels, lubricants, and component technologies for use in aircraft and missile engines. Conventional petroleum and alternate fuels are developed and evaluated for Air Force applications. Fuels and lubricants must be thermally stable, cost-effective, and operate at higher temperatures.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,482 Developed high thermal stability hydrocarbon fuels to provide higher heat capacity and operating temperatures for aircraft and missile systems. This technology is for current and future aircraft to reduce fuel systems fouling/coking, and provide cooling for increased avionics loads, higher engine temperatures, and reduced fuel consumption. <ul style="list-style-type: none"> - (U) Validated performance and cost benefits of JP-8+100 fuel to increase sortie generation. - (U) Validated advanced fuel system components that allow the utilization of the heat sink of JP-8+100 fuel. - (U) Continued effort in coal-derived fuel Research and Development. - (U) \$2,668 Developed high performance, low emissions, robust combustor concepts for advanced turbine engines. This will reduce the risk and cost associated with developing high performance, low maintenance engines that operate efficiently within air pollution guidelines and have high thrust-to-weight ratio and low specific fuel consumption. <ul style="list-style-type: none"> - (U) Established combustor design rules through characterization of a high performance, low emissions six-inch sector of a trapped vortex combustor (TVC) at atmospheric pressure and utilized these rules to design a high pressure full-scale TVC sector. - (U) Constructed a high temperature, high pressure combustion facility to test full-scale combustor sectors for advanced turbine engines. - (U) Evaluated fuel injector concepts in a low pressure combustion rig to fully characterize combustion performance and emissions levels. - (U) \$4,635 Developed lubricant technology to permit efficient high-speed rotation of turbine engine components. This technology includes conventional and advanced lubricants, and mechanical systems extended to their highest temperature limitations and approaches, such as magnetic levitation and solid and vapor lubrication for advanced engines with operating conditions that exceed the capabilities of conventional approaches. <ul style="list-style-type: none"> - (U) Verified vapor phase lubrication as primary system in expendable and limited life gas turbine engines. - (U) Verified magnetic levitation and control as full replacement for conventional lubricants and bearings in an advanced gas generator. - (U) \$11,785 Total 											
Project 3048			Page 6 of 16 Pages				Exhibit R-2 (PE 0602203F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion	
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<p>– (U) \$6,297</p>	<p>Develop high thermal stability hydrocarbon fuels to provide higher heat capacity and operating temperatures for aircraft and missile systems. This technology is for current and future aircraft to reduce fuel systems fouling/coking, and provide cooling for increased avionics loads, higher engine temperatures, and reduced fuel consumption.</p>	
<p>– (U) Evaluate fuel additives to increase the high temperature stability of fuels above 425°F.</p>		
<p>– (U) Validate advanced fuel system components that allow the utilization of the heat sink of JP-8+100 and other high heat sink fuels.</p>		
<p>– (U) Continue effort in coal-derived fuel Research and Development.</p>		
<p>– (U) \$1,846</p>	<p>Develop high performance, low emissions, robust combustor concepts for advanced turbine engines. This will reduce the risk and cost associated with developing high performance, low maintenance engines that operate efficiently within air pollution guidelines and have high thrust-to-weight ratio and low specific fuel consumption.</p>	
<p>– (U) Evaluate high performance, low emissions, full-scale sector of a trapped vortex combustor for transition to advanced turbine engines.</p>		
<p>– (U) Evaluate effectiveness of a high temperature fuel/air heat exchanger for cooling turbine vanes at the exit of a trapped vortex combustor.</p>		
<p>– (U) Establish combustor design rules through characterization of a high performance, low emissions six-inch sector of an integrated lightweight combustor (ILC) at atmospheric pressure and utilize these rules to design a high pressure full-scale ILC sector.</p>		
<p>– (U) \$2,780</p>	<p>Develop lubricant technology to permit efficient high-speed rotation of turbine engine components. This technology includes conventional and advanced lubricants, and mechanical systems extended to their highest temperature limitations and approaches, such as magnetic levitation and solid and vapor lubrication for advanced engines with operating conditions that exceed the capabilities of conventional approaches.</p>	
<p>– (U) Demonstrate advanced liquid lubricant, fully functional from -40°F to +600°F, in test engine.</p>		
<p>– (U) Integrate vapor phase lubricant system into expendable-class engine demonstrator for full operational evaluation.</p>		
<p>– (U) Develop a fully integrated rotor support and control system based on a high temperature, hybrid (magnetic/mechanical) bearing set.</p>		
<p>– (U) \$10,923</p>	<p>Total</p>	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p>		
<p>– (U) \$4,407</p>	<p>Develop high thermal stability hydrocarbon fuels to provide higher heat capacity and operating temperatures for aircraft and missile systems. This technology is for current and future aircraft to reduce fuel systems fouling/coking, and provide cooling for increased avionics loads, higher engine temperatures, and reduced fuel consumption.</p>	
<p>– (U) Evaluate advanced fuel additives to increase fuel thermal stability to 900 °F.</p>		
<p>– (U) Evaluate fuel system components that utilize the heat sink of supercritical fuels.</p>		
<p>– (U) \$2,573</p>	<p>Develop high performance, low emissions, robust combustor concepts for advanced turbine engines. This will reduce the risk and cost associated with developing high performance, low maintenance engines that operate efficiently within air pollution guidelines and have high thrust-to-weight ratio and low specific fuel consumption.</p>	
<p>– (U) Evaluate high performance, low emissions, full-scale sector of a trapped vortex combustor using a microwave ignition system.</p>		
<p>– (U) Evaluate effectiveness of an endothermic fuel/air heat exchanger for cooling turbine vanes at the exit of an integrated lightweight combustor (ILC).</p>		
<p>– (U) Evaluate high performance, low emissions, full-scale sector of an ILC for transition to advanced turbine engines.</p>		
<p>– (U) \$4,810</p>	<p>Develop lubricant technology to permit efficient high-speed rotation of turbine engine components. This technology includes conventional and advanced lubricants, and mechanical systems extended to their highest temperature limitations and approaches, such as magnetic levitation and solid and vapor lubrication for advanced engines with operating conditions that exceed the capabilities of conventional approaches.</p>	
<p>– (U) Complete transition of advanced, broad temperature range, liquid lubricant to a fully qualified, field-ready material.</p>		
<p>– (U) Evaluate vapor phase lubricants for piloted, unlimited life applications.</p>		
<p>– (U) Integrate hybrid magnetic bearing into a core (high pressure), single spool demonstrator engine.</p>		
<p>– (U) Develop hybrid magnetic bearing for full control of a low pressure rotor in preparation for fully integrated, hybrid magnetic bearing supported, dual-spool engine demonstrator.</p>		
<p>– (U) \$11,790</p>	<p>Total</p>	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602203F Aerospace Propulsion				PROJECT 3066				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3066 Turbine Engine Technology				36,391	31,998	40,745	42,194	42,870	43,241	45,441	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Develops technology to increase propulsion system operational reliability, mission flexibility, and performance while reducing weight, fuel consumption, and cost of ownership. Analytical and experimental efforts are conducted in fans/compressors, high temperature combustors, turbines, internal flow systems, controls, exhaust systems, and structural design. This project supports the Integrated High Performance Turbine Engine Technology (IHPTET) program.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$24,783 Developed core engine components for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost. <ul style="list-style-type: none"> - (U) Demonstrated advanced compressors with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher compressor exit temperature capability, lower weight, and improved seals. - (U) Demonstrated advanced combustors with higher combustion efficiencies, lower manufacturing costs, increased robustness, higher combustion temperature, lower weight, and improved temperature patterns. - (U) Demonstrated advanced turbines with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature, lower weight, and improved cooling effectiveness. - (U) \$6,494 Developed turbine engine components (fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology) for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost. <ul style="list-style-type: none"> - (U) Demonstrated advanced fan with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight. - (U) \$2,632 Developed components for expendable engines for missile and unmanned air vehicle applications. These components will provide expendable engines with reduced cost, reduced fuel consumption, and increased specific thrust, greatly expanding the operating envelopes of cruise missiles. <ul style="list-style-type: none"> - (U) Demonstrated advanced combustor with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight. 												
Project 3066				Page 10 of 16 Pages				Exhibit R-2 (PE 0602203F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion	
		PROJECT 3066
– (U) \$2,482	Developed components for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports.	
	– (U) Demonstrated advanced turbine with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature, lower weight, and improved cooling effectiveness.	
– (U) \$36,391	Total	
(U) FY 1998 (\$ in Thousands):		
– (U) \$28,948	Develop core engine components for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost.	
	– (U) Design and fabricate Integrated High Performance Turbine Engine Technology (IHPTET) Phase III advanced compressors with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher compressor exit temperature capability, lower weight, and improved seals.	
	– (U) Design and fabricate IHPTET Phase III advanced combustors with higher combustion efficiencies, lower manufacturing costs, increased robustness, higher combustion temperature, lower weight, and improved temperature patterns.	
	– (U) Design and fabricate IHPTET Phase III advanced turbines with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature, lower weight, and improved cooling effectiveness.	
– (U) \$3,050	Develop turbine engine components (fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology) for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost.	
	– (U) Design and fabricate IHPTET Phase III advanced fan with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight.	
– (U) \$31,998	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion	PROJECT 3066
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$28,575 Develop core engine components for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost. <ul style="list-style-type: none"> - (U) Demonstrate Integrated High Performance Turbine Engine Technology (IHPTET) Phase III advanced compressors with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher compressor exit temperature capability, lower weight, and improved seals. - (U) Demonstrate IHPTET Phase III advanced combustors with higher combustion efficiencies, lower manufacturing costs, increased robustness, higher combustion temperature, lower weight, and improved temperature patterns. - (U) Demonstrate IHPTET Phase III advanced turbines with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature, lower weight, and improved cooling effectiveness. - (U) \$6,765 Develop turbine engine components (fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology) for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. These components will provide aircraft engines with higher performance, increased durability, reduced fuel consumption, and lower life cycle cost. <ul style="list-style-type: none"> - (U) Conduct advanced fan component development with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight. - (U) Conduct advanced low spool turbine component development with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight. - (U) Design and fabricate IHPTET Phase III advanced controls and exhaust nozzles with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, lower weight, and improved cooling effectiveness. - (U) \$2,782 Develop components for expendable engines for missile and unmanned air vehicle applications. These components will provide expendable engines with reduced cost, reduced fuel consumption, and increased specific thrust, greatly expanding the operating envelopes of cruise missiles. <ul style="list-style-type: none"> - (U) Design and fabricate IHPTET Phase III advanced combustor with higher aerothermodynamic efficiencies, lower manufacturing costs, increased robustness, and lower weight. - (U) \$2,623 Develop components for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. <ul style="list-style-type: none"> - (U) Design and fabricate IHPTET Phase III advanced turbine with higher aerodynamic efficiencies, lower manufacturing costs, increased robustness, higher turbine inlet temperature, lower weight, and improved cooling effectiveness. - (U) \$40,745 Total 		
Project 3066	Page 12 of 16 Pages	Exhibit R-2 (PE 0602203F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion	PROJECT 3145
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3145 Aerospace Power Technology	13,815	14,340	14,565	14,594	15,786	15,243	16,157	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Develops technologies for aerospace power generation, conversion, and transmission systems including advanced electrical power component and subsystem technologies. Power components are developed for aircraft and flight line equipment to increase reliability, maintainability, commonality, and supportability. This project supports an initiative which uses electrical power to replace hydraulic and pneumatic power and their costly logistics support. These electrical power technologies are necessary to meet the 10-20 year long-term storage requirements of Air Force uninhabited combat aerial vehicles (UCAVs). Electrical power generation technologies developed are enabling technologies all future military directed energy (DE) weapon systems. Essentially, all power electronics (conversion) technology being developed here has dual-use opportunities. Spin-off application areas include all military system conversion development from conventional to electrically-based on-board subsystems.

(U) FY 1997 (\$ in Thousands):

- (U) \$12,033 Developed aerospace batteries and power generation, conversion, and transmission components for aircraft systems. These components provide aircraft with a high degree of self-sufficiency, improved reliability, maintainability, and supportability, all yielding a quicker aircraft turn-around time. In addition, ground support equipment requirements will be dramatically reduced.
 - (U) Demonstrated electrical components essential for a fault tolerant electrical power system.
 - (U) Completed test and demonstration of high temperature semiconductor switches to demonstrate increased operating temperature and improved reliability.
 - (U) Completed fabrication of internal engine starter/generator which leads to elimination of engine gear box.
- (U) \$1,247 Developed battery systems for guidance, navigation, control functions for missile systems, and for use in navigational aids, radios, and sensors for special operations forces. Batteries with higher power density, longer life, increased reliability, and rechargability will provide missiles systems and special operations forces with greater reliability and reduced maintenance costs.
 - (U) Demonstrated lithium cells for use in rechargeable batteries--allows three-fold reduction in mass and volume over existing batteries.
- (U) \$535 Developed special purpose power components for advanced surveillance and communications systems, as well as ground power applications.
 - (U) Developed next generation electrical conductors with 50% increase in current density and higher operating temperature for advanced lightweight electrical generators.
- (U) \$13,815 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion	
		PROJECT 3145
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$12,327	Develop aerospace batteries and power generation, conversion, and transmission components for aircraft systems. These components provide aircraft with a high degree of self-sufficiency, improved reliability, maintainability, and supportability, all yielding a quicker aircraft turn-around time. In addition, ground support equipment requirements will be dramatically reduced.	
	– (U) Develop advanced power generation, conversion, and distribution components for a fault tolerant electrical power system.	
	– (U) Begin testing internal engine starter/generator which leads to elimination of engine gear box.	
– (U) \$1,505	Develop battery systems for guidance, navigation, control functions for missile systems, and for use in navigational aids, radios, and sensors for special operations forces. Batteries with higher power density, longer life, increased reliability, and rechargability will provide missiles systems and special operations forces with greater reliability and reduced maintenance costs.	
	– (U) Develop new cathode materials for lithium batteries to enhance cycle life.	
– (U) \$508	Develop special purpose power components for advanced surveillance and communications systems, as well as ground power applications.	
	– (U) Develop improved ceramic processing of coated conductors to optimize crystallization of conductors.	
– (U) \$14,340	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$12,350	Develop power generation components for aircraft systems. These components improve aircraft self-sufficiency, reliability, maintainability, and supportability.	
	– (U) Complete initial testing of the internal engine starter/generator rig demonstration which leads to elimination of engine gear box.	
– (U) \$1,730	Develop battery components for use in navigational aids, radios, and sensors for special operations forces. Batteries with higher power density, longer life, increased reliability, and rechargability will provide special operations forces with greater reliability and reduced maintenance costs.	
	– (U) Evaluate performance for lithium cells and down-select based on performance of cathode material.	
– (U) \$485	Develop special purpose power components for advanced directed energy weapon systems, as well as ground power applications.	
	– (U) Evaluate conductors produced under new process which will provide 25% improved current density and 15% increase in operating temperature capability.	
– (U) \$14,565	Total	
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602203F Aerospace Propulsion	PROJECT 3145
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	14,551	15,113	14,898	Cont
(U) Current Budget Submit/FY 1999 PB	13,815	14,340	14,565	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603216F, Aerospace Propulsion and Power Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602204F Aerospace Avionics					
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	63,953	61,025	65,549	67,461	72,064	73,182	75,279	Continuing	Continuing
2000 Electronic Countermeasures Technology	13,141	14,570	15,917	16,882	17,405	17,944	18,319	Continuing	Continuing
2001 Electro-Optical Technology	8,780	6,134	490	0	0	0	0	Continuing	Continuing
2002 Microwave Technology	8,489	9,613	9,341	9,092	10,561	10,011	10,212	Continuing	Continuing
2003 Avionics System Design Technology	8,233	6,317	9,498	10,070	10,459	10,751	11,029	Continuing	Continuing
6095 Information Fusion Technology	9,771	7,486	11,606	12,729	13,604	14,368	15,120	Continuing	Continuing
6096 Microelectronics Technology	7,586	9,273	9,475	8,906	9,874	9,679	9,898	Continuing	Continuing
7622 Radio Frequency Sensor Technology	7,953	7,632	9,222	9,782	10,161	10,429	10,701	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: For FY 1998 and beyond, several projects in this PE have been combined. For clarity, the FY 1997 portions of this exhibit have used the new project structure. Project 2000, Active Electronic Countermeasures, and Project 7633, Passive Electronic Countermeasures, have been combined within Project 2000, Electronic Countermeasures Technology. Project 2001, Electro-Optical Technology, and Project 2004, Reconnaissance/Strike Electro-Optical Sensors, have been combined within Project 2001, Electro-Optical Technology. (After FY 1999, Project 2001 will terminate due to budget constraints and priorities within the Science and Technology Program.) Project 6095, Inertial Reference and Guidance Technology, and Project 7629, Fire Control Avionics, have been combined within Project 6095, Information Fusion Technology. Project 7622, Reconnaissance Strike Radio Frequency Sensors, and Project 7662, Avionics Data Transmission and Reception, have been combined within Project 7622, Radio Frequency Sensor Technology.

(U) A. **Mission Description and Budget Item Justification:** This Applied Research program develops the technology base for Air Force aerospace avionics. Advances in aerospace avionics are required to increase combat effectiveness, reduce life cycle costs, facilitate modernization of aging and future aerospace platforms, and provide protection against emerging hostile threat systems. Meeting these needs necessitates simultaneous advances in multiple, interrelated disciplines including: airborne sensors (e.g., infrared, radar, etc.); multi-function high-power electronic devices; target detection, classification, and recognition; fire control; communication and navigation subsystems; and electronic warfare technologies. To permit new capabilities to transition smoothly to warfighters, this program also develops avionics architectures, data processing technologies, and sensor integration techniques. This investment strategy will permit the Air Force to move away from costly independent “black box” avionics to open system avionics that combine common modules, shared components, and commercial devices into integrated, easily-upgradable systems. Advanced, integrated avionics technologies will give warfighters the combat edge they need at an affordable price. Note: In FY 1998, Congress added \$2.0 M for Environmental Laser Mapping.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 2 - Applied Research		PE NUMBER AND TITLE 0602204F Aerospace Avionics		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	65,360	69,401	70,469	Cont
(U) Appropriated Value	68,061	64,144		
(U) Adjustments to Appropriated Value				Cont
a. Congressional/General Reductions	-1,444	-2,464		
b. SBIR	-1,134	-655		
c. Omnibus/Other Above Threshold Reprogrammings	-1,460			
d. Below Threshold Reprogrammings				
e. Rescissions	-70			
(U) Adjustments to Budget Year Since FY 1998 PB			-4,920	
(U) Current Budget Submit/FY 1999 PB	63,953	61,025	65,549	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602204F Aerospace Avionics				PROJECT 2000				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2000	Electronic Countermeasures Technology			13,141	14,570	15,917	16,882	17,405	17,944	18,319	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This program determines the feasibility of active and passive electronic countermeasure technologies and explores, develops, expands, and refines the most promising and cost-effective technologies. The technologies pursued support passive sensing of the entire electromagnetic spectrum in order to provide signal collection, detection, recognition, analysis, identification, location, and countering of enemy electronic emissions whether intentional or unintentional. This project includes development of countermeasure concepts against radar, infrared (IR), and electro-optical threat weapon systems as well as against communication command and control networks. Various links and sensors of threat air defense systems are analyzed and a database of countermeasure techniques and technologies is generated from which specific self-protection or support countermeasures equipment can be developed. Specifically, the program exploits emerging technologies to provide increased capability for: 1) radar warning, radio frequency (RF) electronic warfare, and electronic intelligence applications; 2) IR detection for passive missile warning, IR signature exploitation, and IR countermeasures; 3) laser detection for threat warning and countermeasures; 4) passive and combined passive/active off-board expendables (chaff, decoys, etc.); and 5) hardware and software for associated processing and technology integration needs. These countermeasure capabilities are vital for survival of operational aerospace platforms facing advanced threats in future hostile environments.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,888 Develop technologies for on-board and off-board (active IR decoys) countermeasures to counter IR-guided missiles. <ul style="list-style-type: none"> - (U) Continued development and in-house evaluation of on-board IR countermeasures against imaging missile seekers. - (U) Continued development of IR flare technology using advanced materials. - (U) Continued to develop concepts for countermeasures against laser beamrider missiles. - (U) Continued to develop concepts for countermeasures against night vision devices which are used to augment IR missile launchers. - (U) \$1,439 Develop off-board RF countermeasures concepts (active decoys) for affordable survivability against radar threats. <ul style="list-style-type: none"> - (U) Tested active decoys using advanced jamming modulations tailored to counter coherent radar threats. - (U) Identified countermeasures techniques and technology for decoys operating in the high-millimeter band frequency range. - (U) \$1,916 Develop affordable, on-board RF technology and concepts to achieve solutions to countermeasures requirements related to radar-controlled lethal threat systems. <ul style="list-style-type: none"> - (U) Investigated integrated angle, doppler, and range deception techniques to effectively jam coherent monopulse threat tracking radars. - (U) Fabricated and tested narrow-band, digital RF memory architecture. - (U) Tested and evaluated a unique modulation component for digital jamming. 												
Project 2000				Page 3 of 32 Pages				Exhibit R-2 (PE 0602204F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2000
– (U) \$1,709	Develop on-board radio frequency (RF) countermeasures against voice and data communications elements of enemy air defense systems. – (U) Fabricated and tested breadboard hardware to jam the special data signals used for command and control of lethal threat systems. – (U) Developed techniques to jam communications systems which use featureless waveforms.	
– (U) \$1,855	Develop technology for generic hardware and software modules to enable low-cost block upgrades to electronic warfare (EW) receivers. – (U) Ground-tested combined de-interleaving, correlation, and threat identification software modules. – (U) Ran initial concept tests for threat parameter normalization software.	
– (U) \$1,471	Develop all-digital EW receiver and associated antenna for improved reliability and flexibility in response to ever changing EW threats. – (U) Evaluated fundamental angle and RF hardware correlator for improved performance and reliability. – (U) Continued to develop angle/frequency discrimination concepts to respond to new threat signals.	
– (U) \$1,559	Develop an enhanced warning capability with advanced detector and processing technology and integrated missile warning, laser warning, and targeting sensors for an improved pilot protection capability. – (U) Developed low-cost multicolor infrared (IR) filtering technique for IR focal plane array system.	
– (U) \$1,304	Continue development of models for off-board, expendable electronic countermeasures for use in chaff and decoy dispensing programs. – (U) Flight-tested “environmental chaff” for use in combat training exercises. – (U) Developed breadboard for advanced, passive, expendable, off-board countermeasures.	
– (U) \$13,141	Total	
(U) FY 1998 (\$ in Thousands):		
– (U) \$3,363	Develop technologies for on-board and off-board (active IR decoys) countermeasures to counter IR-guided missiles and electro-optical directed threat systems. – (U) Continue development and in-house evaluation of on-board IR countermeasure against imaging missile seekers. – (U) Initiate development of a shielded narrowband IR source for advanced IR decoys to minimize out-of-band detection. – (U) Complete analysis of laser beamrider missile countermeasure concepts and downselect for laboratory and field testing. – (U) Conduct laboratory tests demonstrating effects of countermeasure concepts against enemy night vision devices. – (U) Continue to develop cooperative on-board and off-board IR countermeasure concepts for synergistic effects.	
– (U) \$4,126	Develop affordable radio frequency (RF) jamming technology and concepts which degrade enemy radar, missiles, and command and control systems. This will enhance aircraft survivability. – (U) Test countermeasures to effectively and affordably degrade monopulse threat tracking radars to assure survivability of our aircraft. – (U) Continue evaluation of digital RF memory architecture to provide the capability to defeat coherent doppler fire control radars. – (U) Develop digital jamming pulse quality metrics to enhance evaluation of countermeasure technique effectiveness. – (U) Investigate concepts for countermeasures against covert threat communication links that use featureless waveforms. – (U) Conduct in-house evaluation of RF countermeasure techniques to defeat advanced radar, missile, and communication threats.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	
		PROJECT 2000
– (U) \$771	Develop off-board (expendable) RF countermeasure concepts for affordable survivability against radar threats. <ul style="list-style-type: none"> – (U) Design active decoys to counter surface and airborne threats using microwave and millimeter wave radars. – (U) Continue development of design tools and analytic methods to predict the effectiveness of advanced chaff payloads, dispensing methods, and tactics. – (U) Develop and test environmentally degradable and electromagnetically tailorable chaff designs to allow for the resumption of chaff usage during combat training exercises and to provide advanced countermeasure techniques. 	
– (U) \$1,542	Develop technology for generic software modules to enable low-cost block upgrades to electronic warfare receivers. <ul style="list-style-type: none"> – (U) Continue ground-testing combined de-interleaving, correlation, and threat identification software modules to detect new threat systems without expensive hardware upgrades. – (U) Complete preliminary design of advanced threat parameter normalization software to allow aircraft to share situational awareness data. 	
– (U) \$3,854	Develop affordable RF receiver and antenna technology for use in operational and future aircraft. This technology is needed to detect, characterize, and identify threats in increasingly complex environments while maintaining own aircraft covertness and emission control. <ul style="list-style-type: none"> – (U) Complete testing of wideband digital receiver brassboard to affordably increase threat coverage. – (U) Continue development of wideband receiver specialized software for threat characterization, identification, and location. – (U) Develop narrowband digital receiver technology to provide a limited capability to inexpensively update operational systems. – (U) Complete design of a six to eight gigahertz, low-profile (less than one inch) conformal antenna array and investigate its electromagnetic characterization. – (U) Transition software for design and evaluation of flush-mounted conformal arrays. 	
– (U) \$914	Develop missile and laser warning technology to accurately cue countermeasures, improving survivability. <ul style="list-style-type: none"> – (U) Continue development of laser warning discrimination techniques for countermeasure cueing. – (U) Continue evaluation of infrared (IR) clutter rejection techniques for two times improvement in IR missile warning range. – (U) Continue development and evaluation of multi-frequency, non-mechanical filters for fifty percent reduction in false alarm rates. – (U) Complete development of laser warning breadboard. 	
– (U) \$14,570	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$4,846	Develop technologies for on-board and off-board (active IR decoys) countermeasures to counter IR-guided missiles and electro-optical directed threat systems. <ul style="list-style-type: none"> – (U) Continue development and in-house evaluation of on-board IR countermeasure against imaging missile seekers. – (U) Conduct laboratory tests of laser beamrider missile countermeasure concepts. – (U) Continue to develop cooperative on-board and off-board IR countermeasure concepts. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2000
– (U) \$2,677	Develop affordable radio frequency (RF) jamming technology and concepts which degrade enemy radar, missiles, and command and control systems. This will enhance aircraft survivability.	
	– (U) Develop new, multifunction RF waveforms for flexible countermeasures against unexpected/unknown threats systems.	
	– (U) Continue developing advanced deception countermeasures techniques to assure capability to degrade new/upgraded threat radars.	
	– (U) Develop techniques to degrade modern communications networks used for enemy command and control.	
	– (U) Conduct in-house laboratory evaluation of RF countermeasure techniques to defeat advanced radar, missile, and communication threats.	
– (U) \$305	Develop off-board (expendable) RF and combined IR/RF countermeasure concepts for affordable survivability against radar threats.	
	– (U) Continue design of active decoys to counter surface and airborne threats using microwave and millimeter wave radars.	
	– (U) Demonstrate advanced active or passive expendable techniques that decoy tracking radars away from our aircraft.	
– (U) \$2,095	Develop technology for generic software modules to enable low-cost block upgrades to electronic warfare receivers.	
	– (U) Demonstrate combined de-interleaving, correlation, and threat identification software modules.	
	– (U) Develop next-generation receiver algorithms to leverage flexible, digital receiver architectures.	
– (U) \$4,689	Develop affordable radio frequency (RF) receiver and antenna technology for use in operational and future aircraft. This technology is needed to detect, characterize, and identify threats in increasingly complex environments while maintaining own aircraft covertness and emission control.	
	– (U) Develop new techniques for wideband to narrowband receiver cueing.	
	– (U) Demonstrate first wideband all-digital receiver.	
	– (U) Demonstrate dual-use conformal array technology and continue electromagnetic characterization.	
– (U) \$1,305	Develop missile and laser warning technology to accurately cue countermeasures, improving survivability.	
	– (U) Develop laser warning discrimination techniques for cueing countermeasures.	
	– (U) Continue evaluation of infrared (IR) clutter rejection techniques for improved IR missile warning.	
	– (U) Continue development of multi-color, non-mechanical filters for IR missile warning.	
– (U) \$15,917	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602204F Aerospace Avionics				PROJECT 2001		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2001	Electro-Optical Technology	8,780	6,134	490	0	0	0	0	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: This project focuses on the development of military unique and essential devices and components for airborne optical sensing, optical processing, and integration of electro-optical technology into avionics sensor systems. Electro-optical technologies provide faster, more accurate detection and targeting capability combined with the benefits of low weight and low-power requirements. The results of this technology provide the warfighter with increased situational awareness, enhanced defense suppression, and improved precision weapon delivery. Note: In FY 1998, Congress added \$2.0 M for Environmental Laser Mapping.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,863 Develop short pulse infrared and ultraviolet source technologies for target recognition and designation. <ul style="list-style-type: none"> - (U) Continued development and evaluation of solid state and semiconductor technologies for target recognition and designation. - (U) \$1,490 Develop high-throughput, real-time optical processing technology to improve precision in imaging and target recognition. <ul style="list-style-type: none"> - (U) Developed and evaluated sources and components for greater speed and testability of optical subsystems. - (U) \$1,603 Develop ultraviolet technology for imaging, tracking, and jet engine analysis. <ul style="list-style-type: none"> - (U) Continued development and evaluation of semiconductor technology to improve the performance and reliability of detector arrays. - (U) \$931 Develop advanced electro-optical sensor technology for combined navigation and air-to-ground targeting in a multi-function sensor. This thrust is aimed at alleviating the weight, drag, maintenance, and cost problems of a dual sensor approach. <ul style="list-style-type: none"> - (U) Completed development of algorithms that can perform targeting on multiple scenes at the same time. - (U) Completed development of electronic stabilization algorithms allowing for range enhancement of electro-optical sensor technology for combined navigation and air-to-ground targeting. - (U) \$585 Develop and demonstrate a low-cost, maintainable, high performance, non-mechanical method of directing the passive sensor field of view. Mechanical methods of scanning the target scene are inherently bulky, expensive, and unreliable. A non-mechanical approach will also permit the use of low-cost staring focal plane arrays which will enhance overall performance. <ul style="list-style-type: none"> - (U) Completed the design, fabrication, and absolute pointing accuracy verification of a phased array beam steering component. - (U) \$2,308 Develop and demonstrate frequency agile electro-optical technologies to enhance air-to-ground and air-to-air sensor performance, target detection ranges, and identification. <ul style="list-style-type: none"> - (U) Completed application and requirements analysis of electro-optical technologies for precision targeting of ground-based and airborne threats. - (U) \$8,780 Total 										
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2001
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$1,284	Develop ultraviolet technology for applications such as missile threat warning, communications, and jet engine analysis.	
	– (U) Continue to develop solid state laser technology for a safer, high-power, more reliable, ultraviolet source in one-fifth the size.	
	– (U) Develop solar-blind, ultraviolet detector technology for smaller, higher performance missile warning receivers with significantly reduced false alarm rates.	
– (U) \$311	Develop high-speed opto-electronics technology for faster interfaces between electronic components. Applications include high-speed data processing, analog to digital converters, digital radar, and real-time image and target recognition. These development efforts are jointly planned with the Defense Advanced Research Projects Agency.	
	– (U) Develop optical interconnect technology for high-speed electronic and opto-electronic multichip modules that will provide four times data rate increase with greater antenna to processor distances for digital radar applications.	
	– (U) Develop optical lithography technology for the fabrication of high-speed, integrated electronics and opto-electronic multichip modules with increased resolution and five times faster throughput at one-tenth the cost.	
– (U) \$747	Develop affordable, supportable, manufacturable high definition/resolution displays with the following performance characteristics: all digital interface; sunlight readability; and high reliability.	
	– (U) Demonstrate technology to increase the optical efficiency of active matrix liquid crystal displays by at least a factor of two.	
	– (U) Continue adapting low-cost, commercial-based, digital display interface to drive high definition military displays.	
	– (U) Continue development of large area, high resolution, sunlight readable cockpit field emission display.	
	– (U) Begin development of flat panel head-up display (HUD) to improve reliability over existing cathode ray tube HUDs and explore replacement of classical optics with lighter, more compact diffractive projection optics.	
– (U) \$1,369	Develop advanced electro-optical sensor technologies, including non-mechanical beam steering techniques, for a single compact, affordable navigation and targeting sensor.	
	– (U) Complete design and begin fabrication of a multi-function sensor, incorporating multiple apertures, with a three times improvement in target detection range and four times improvement in identification range.	
– (U) \$2,433	Develop and demonstrate frequency agile electro-optical technologies to enhance air-to-ground and to air-to-air sensor performance, increase target detection and identification ranges, and defeat heat-seeking missiles.	
	– (U) Demonstrate, through ground and airborne experiments, the value of modular wind profiling to cargo and bomb drop applications.	
	– (U) Develop narrow bandwidth, tunable infrared (IR) source technology for multispectral sensing.	
	– (U) Develop first-generation coatings to enhance the reliability of mid-IR optics.	
	– (U) Complete preliminary design of a compact, medium-range, airborne laser radar to detect small concentrations of pollutants and chemical agents.	
– (U) \$6,134	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2001															
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$490 Develop advanced electro-optical sensor technologies, including non-mechanical beam steering techniques, for a single compact, affordable navigation and targeting sensor. <li style="padding-left: 100px;">- (U) Complete fabrication and begin laboratory testing multi-function sensor. - (U) \$490 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">8,860</td> <td style="text-align: center;">5,749</td> <td style="text-align: center;">4,394</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">8,780</td> <td style="text-align: center;">6,134</td> <td style="text-align: center;">490</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: After FY 1999, this Project will terminate due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles. - (U) PE 0602702F, Command, Control, and Communications. - (U) PE 0603270F, Electronic Combat Technology. - (U) PE 0602712E, Materials and Electronics Technology. - (U) PE 0603739E, Advanced Electronics Technology. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY 1998 PB)	8,860	5,749	4,394	Cont	(U) Current Budget Submit/FY 1999 PB	8,780	6,134	490	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>													
(U) Previous President's Budget (FY 1998 PB)	8,860	5,749	4,394	Cont													
(U) Current Budget Submit/FY 1999 PB	8,780	6,134	490	Cont													
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602204F Aerospace Avionics				PROJECT 2002		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2002 Microwave Technology	8,489	9,613	9,341	9,092	10,561	10,011	10,212	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project focuses on the generation, control, reception, and processing of microwave and millimeter wave power. Develops technologies such as solid state and vacuum electronic power devices and amplifiers, low noise and signal control components, high-temperature electronics, multi-function monolithic integrated circuits, and high density packaging and interconnects. Develops techniques for integrating various combinations of these technologies to demonstrate significantly improved performance with smaller size, lower weight, lower cost, and higher reliability in military-specific applications. The requirements for device and component technology developments are based on Air Force and other DoD weapon systems needs in the areas of radar, communications, electronic warfare (EW), navigation, and smart weapons applications.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$1,623 Develop mixed-mode, microwave/digital multi-function integrated circuits components for radar and EW receivers and for digital phased array radars. <ul style="list-style-type: none"> – (U) Continued to develop advanced analytical methods for evaluating mixed-mode integrated components. – (U) Designed and developed mixed-mode signal control component for reduced weight and volume of airborne receiver systems. – (U) \$2,013 Develop high-power, solid state amplifiers for radar and communications applications. <ul style="list-style-type: none"> – (U) Designed and developed high-power, high-efficiency amplifiers for phased array radars which increase the performance and efficiency in the 1-20 gigahertz frequency band. – (U) Developed high-power transmit amplifiers for precision guided weapons. – (U) Developed advanced transistors and fabrication techniques for microwave power amplifiers that produce higher power (via improved heat dissipation) for compact, reliable, and affordable radio frequency sensors. – (U) \$1,708 Develop reliable, high-operating-temperature electronics for microwave transmitters used in airborne applications. <ul style="list-style-type: none"> – (U) Continued development of candidate materials that will improve the reliability of microwave transistors. – (U) Developed integrated circuits for reliable, high-power operation of advanced EW and radar applications. – (U) \$1,496 Develop high-power vacuum electronics devices and components for EW, radar, and communications applications. <ul style="list-style-type: none"> – (U) Fabricated components for advanced microwave tubes to improve reliability of radio frequency subsystems. – (U) Continued fabrication and testing of millimeter wave power modules to increase range capability of communications and electronic combat transmitters over the 20 to 40 gigahertz frequency range. 										
Project 2002			Page 11 of 32 Pages				Exhibit R-2 (PE 0602204F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	
		PROJECT 2002
– (U) \$1,649	Develop millimeter wave integrated circuits for terminal guidance and communications systems.	
	– (U) Continued development and initiated test of integrated circuit signal control components to improve the performance and reliability of millimeter wave terminal guidance radars.	
– (U) \$8,489	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$1,550	Develop military essential mixed-mode (e.g., high-power/low-noise, microwave/digital, electronic/electro-optical, etc.) multi-function components for radar and electronic warfare (EW) receivers and for digital phased array radars. Application of this compact and more flexible sensor technology will improve warfighter situational awareness, enhance defense suppression, and improve precision weapon delivery.	
	– (U) Evaluate and validate advanced analytical methods for designing integrated analog/digital components to reduce non-recurring engineering costs for systems such as high performance radar and EW receivers.	
	– (U) Fabricate miniature digital receivers which will reduce the weight and volume of airborne receiver systems and enhance situational awareness by increasing target detection/tracking sensitivity.	
– (U) \$3,220	Develop high-power (1 to 100 watts), military unique, solid state transmitters for radar and communications applications. This technology will enable the warfighter to detect and track low radar cross-section targets at greater ranges, improve situational awareness, and enable development of compact affordable transmitters for smaller platforms such as advanced unmanned air vehicles.	
	– (U) Demonstrate 10-watt, 7-12 gigahertz amplifiers for multifunction phased array radars having 25% range improvement without increasing aircraft power requirements.	
	– (U) Demonstrate and transition the first low-cost, 35 gigahertz high-power transmit amplifiers to enable all-weather, precision guided weapons which will improve the range and probability of kill of advanced smart missiles.	
	– (U) Fabricate and test advanced transistors for microwave amplifiers that produce higher power (via improved heat dissipation) for compact, reliable, and affordable radio frequency sensors.	
– (U) \$1,780	Develop high-operating-temperature, military-essential, solid state microwave transmitters used in ground-based and airborne radar applications. This technology allows compact transmitters to be located in remote areas of the platform for increased sensor coverage.	
	– (U) Develop high yield process technologies to enable high-operating-temperature microwave transistors that will improve the reliability and lower the life cycle costs of air defense radars.	
	– (U) Fabricate and evaluate high-operating-temperature integrated circuits to demonstrate potential for application to advanced EW and radar applications with reduced cooling requirements.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2002
<ul style="list-style-type: none"> - (U) \$1,417 - (U) \$1,646 - (U) \$9,613 	<ul style="list-style-type: none"> Develop military unique, very high-power (100 to 1,000 watts) vacuum electronics devices and components for electronic warfare (EW), radar, and communications applications which will result in modular, very compact and affordable microwave and millimeter wave transmitters. <ul style="list-style-type: none"> - (U) Fabricate and test components for advanced microwave tubes for very high-power and wide-bandwidth radar and EW transmitters at one-fifth the size. Develop military unique millimeter wave integrated circuits for terminal guidance and communications systems with reduced size and weight, thereby, enabling the inclusion of these sensors on very small platforms. <ul style="list-style-type: none"> - (U) Fabricate and evaluate millimeter wave integrated circuit signal control components to improve the performance and reliability of terminal guidance radars with enhanced target tracking and detection capabilities. Total 	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,746 - (U) \$2,506 	<ul style="list-style-type: none"> Develop military essential mixed-mode (e.g., high-power/low-noise, microwave/digital, electronic/electro-optical, etc.) multi-function components for radar and EW receivers and for digital phased array radars. Application of this compact and more flexible sensor technology will improve warfighter situational awareness, enhance defense suppression, and improve precision weapon delivery. <ul style="list-style-type: none"> - (U) Demonstrate and refine advanced analytical methods for evaluating mixed-mode integrated components to reduce non-recurring engineering costs for systems such as high performance radar and EW receivers. - (U) Demonstrate miniature digital receivers and direct digital waveform transmitters which will reduce the weight and volume of airborne receiver systems and enhance situational awareness by increasing target detection/tracking sensitivity. Develop high-power (1 to 100 watts), military unique, solid state transmitters for radar and communications applications. This technology will enable the warfighter to detect and track low radar cross-section targets at greater ranges, improve situational awareness, and enable development of compact affordable transmitters for smaller platforms such as advanced unmanned air vehicles. <ul style="list-style-type: none"> - (U) Demonstrate 5-watt output power, 35 gigahertz high-power transmit amplifiers for precision-guided weapons which will improve the range and probability of kill of advanced smart missiles. - (U) Demonstrate advanced transistors and fabrication techniques for microwave amplifiers that have improved power dissipation and enhanced reliability for use in compact and affordable radio frequency sensors. 	
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2002
<ul style="list-style-type: none"> - (U) \$2,833 Develop high yield process technologies to enable high-operating-temperature, military-essential, solid state microwave transmitters used in ground-based and airborne radar applications. This technology allows compact transmitters to be located in remote areas of the platform for increased sensor coverage. <ul style="list-style-type: none"> - (U) Demonstrate candidate materials that will improve the reliability of microwave transistors used in ground and air defense radars which have increased reliability and lower life cycle costs. - (U) Demonstrate integrated circuits for reliable, high-power operation of advanced electronic warfare and radar applications which will increase the range for detecting targets and jamming threats. - (U) Demonstrate high-power internally matched transistors that will allow replacement of vacuum tube transmitters in high-power radar, improving mobility and lowering support costs. - (U) \$1,256 Develop military unique, very high-power (100 to 1,000 watts) vacuum electronics devices and components for electronic warfare, radar, and communications applications which will result in modular, very compact and affordable microwave and millimeter wave transmitters. <ul style="list-style-type: none"> - (U) Demonstrate components for advanced microwave tubes resulting in increased power and efficiency and reduced size and cost for compact radar and electronic warfare transmitters. - (U) \$9,341 Total 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2003
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2003 Avionics System Design Technology	8,233	6,317	9,498	10,070	10,459	10,751	11,029	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Develops advanced avionics technology for digital processing, software tools and techniques, and systems architectures. Develops new concepts, demonstrates feasibility, and advances technology for avionics system needs. Advances technology for avionics displays, digital processing hardware, sensor integration, and real-time distributed software to improve weapon system performance and avionics availability. Advances in these avionics technologies will multiply weapon systems effectiveness, enhance reliability, and reduce life cycle costs.

(U) FY 1997 (\$ in Thousands):

- (U) \$1,303 Develop advanced technologies to increase functionality and flexibility of embedded, real-time airborne data processing.
 - (U) Developed techniques and tools necessary for translating old computer code from existing avionics processors into advanced commercial-based avionics processors.
 - (U) Developed technology for quantifying trade offs between performance and costs for distributed, multi-processor avionics software.
 - (U) Developed and define a maturation strategy for incorporating Ada 9X features in a distributed, multi-processor avionics application.
- (U) \$2,491 Develop advanced integration, fusion, and data management technologies that enable increased exploitation of avionics assets to provide for more cost-effective system solutions.
 - (U) Developed and tested an avionics brassboard of a scaleable, coherent, interface network that will increase avionics reliability and improve real-time performance.
 - (U) Developed distributed, fault-tolerant extensions to basic object-oriented data base management system.
 - (U) Analyzed performance and environmental requirements of targeted aging platforms; selected commercial-off-the-shelf candidate for demonstration of cost-effective upgrade capability.
- (U) \$2,433 Develop advanced machine intelligence technologies to provide a capability for improved communications, recognition, understanding of sensor data, and pilot aids.
 - (U) Develop insertion concepts for development of avionics breadboards which are compatible with commercial personal computer memory card standards.
 - (U) Design dynamic, real-time scheduling algorithms to improve the correlation of sensors.
 - (U) Continue evaluation of associative control process technology for application to avionics.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2003
<ul style="list-style-type: none"> - (U) \$2,006 - (U) \$8,233 	<ul style="list-style-type: none"> Develop affordable, supportable, producible high definition/resolution displays with all-digital interfaces, that are readable in sunlight, and that are highly reliable (>10,000 hours mean time between failure). - (U) Continued investigation of technology to increase the optical efficiency of active matrix liquid crystal displays to facilitate dissemination of situational data to the pilot. - (U) Developed field-emissive display for high-brightness, sunlight-readable cockpit flight instruments. Total 	
(U) <u>FY 1998 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$1,962 	<ul style="list-style-type: none"> Develop avionics software engineering technologies to improve reliability, quality, and supportability of both existing and next-generation weapon systems software. Successful re-engineering of existing software will dramatically improve the cost of modernizing aging avionics. - (U) Develop an automated method for translating embedded computer software from obsolete avionics processors to advanced commercial-based processors with no loss of performance or capability. - (U) Demonstrate advanced techniques for debugging Air Force application specific avionics software. - (U) Demonstrate automated software testing capability for verifying accuracy of text and dynamic symbology in smart avionics displays. - (U) Develop initial capability for in-flight self-testing and self-correcting mission-critical avionics software. 	
<ul style="list-style-type: none"> - (U) \$1,732 	<ul style="list-style-type: none"> Develop advanced machine intelligence technologies to provide a capability for enhanced management of critical on-board sensors and detection/recognition of targets. - (U) Demonstrate ability to update inertial navigation system using old Global Positioning System (GPS) data to project position when current GPS data is not available. - (U) Demonstrate real-time, object-oriented database management system for increased situational awareness. - (U) Continue development and application of the associative control process (reinforcement learning) technology for combat information fusion. 	
<ul style="list-style-type: none"> - (U) \$2,623 	<ul style="list-style-type: none"> Develop advanced integration technology and evaluate the feasibility of integrating commercial-off-the-shelf components for affordable avionics modernization. - (U) Develop methods for packaging commercial-off-the-shelf products into reliable, maintainable avionics hardware modules. - (U) Demonstrate utility of personal computer processor/memory card technology for upgrading existing fighter aircraft processors. 	
<ul style="list-style-type: none"> - (U) \$6,317 	<ul style="list-style-type: none"> Total 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2003
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,504 Develop software engineering technologies to promote assured performance of complex existing and next-generation air and space platform software. These technologies are critical to ensuring the affordability of future weapon systems. <ul style="list-style-type: none"> - (U) Demonstrate automated means to ensure correctness of mission-critical software that drives complex graphical displays (e.g. cockpit displays, command center consoles, etc.). - (U) Develop capability to perform in-flight self-correcting and self-adapting functions for mission-critical weapon and information systems. - (U) Develop new techniques for scaleable software architectures to rapidly and cost-effectively incorporate new functions. - (U) \$3,429 Develop advanced machine intelligence technologies to provide a capability for enhanced management of critical on-board sensors and detection/recognition of targets. <ul style="list-style-type: none"> - (U) Demonstrate an enhanced, distributed, real-time embedded avionics object-oriented database management system conforming to multi-level security standards. - (U) Demonstrate advanced, multiple target identification capability based on integration of information from disparate sources. - (U) Demonstrate advanced sensor manager for tactical air-to-air and air-to-ground surveillance. - (U) Develop efficient target recognition techniques based on machine intelligence research. - (U) Continue development and application of associative control process (reinforcement learning) technology for combat information fusion. - (U) \$2,565 Develop and demonstrate avionics integration technologies that allows rapid re-allocation of avionics hardware to meet changing operational requirements. These technologies dramatically reduce warfighter timelines for interoperability and adaptability in changing threat environments. <ul style="list-style-type: none"> - (U) Develop technology that merges high-level design information and hardware algorithms to result in reconfigurable, integrated avionics modules that provide weapon and information systems with unprecedented mission adaptability. - (U) \$9,498 Total 		
Project 2003	Page 18 of 32 Pages	Exhibit R-2 (PE 0602204F)

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 2003
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	8,242	9,301	9,689	Cont
(U) Current Budget Submit/FY 1999 PB	8,233	6,317	9,498	Cont

(U) **Change Summary Explanation:**

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0603253F, Advanced Avionics Integration.
- (U) PE 0602301E, Intelligence System Program.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602204F Aerospace Avionics				PROJECT 6095	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
6095 Information Fusion Technology	9,771	7,486	11,606	12,729	13,604	14,368	15,120	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Develops the baseline technologies required to perform management and fusion of on-board sensor information for timely, comprehensive situation awareness, automatic target recognition, integrated fire control, and bomb damage assessment. This project determines the feasibility of technologies and concepts for fire control that aid in precisely locating, identifying, and targeting airborne and surface targets (with emphasis on reduced signature targets and targets of opportunity) to enable new covert tactics for successful accomplishments of air-to-air and air-to-surface strike scenarios</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$979 Develop reference sensors, system integration, and estimation technology to generate a common precision reference to enable high-payoff multiple platform operations through sharing of sensor data. <ul style="list-style-type: none"> – (U) Developed advanced reference and navigation algorithms to enable multiple platforms to share information in a battle area. – (U) \$399 Develop advanced solid state miniature inertial sensor technology to increase the reliability of inertial sensors required for aircraft and to reduce overall avionics size, weight, power, and cost. <ul style="list-style-type: none"> – (U) Fabricated and tested second iteration of a packaged, navigation-grade, micro-machined silicon accelerometer for highly reliable, all-solid state inertial guidance and navigation systems. – (U) \$848 Develop technology for reduced jamming vulnerability and increased precision targeting and strike accuracy of Global Positioning System (GPS) data and to exploit the benefits of GPS data to improve offensive and defensive combat capabilities at reduced cost. <ul style="list-style-type: none"> – (U) Tested signal acquisition techniques to improve the jam resistance of GPS data for aircraft navigation and reference systems. – (U) \$895 Develop technology for low-observable, wideband, multi-function antennas for communications, navigation, and identification functions to reduce the number of antennas required and to increase weapon systems survivability. <ul style="list-style-type: none"> – (U) Completed fabrication and laboratory evaluation of a breadboard wideband digital antenna electronics unit providing small, low-cost, low-loss, beam forming/null-steering communication, navigation, and identification antennas. – (U) \$379 Develop advanced aircraft air engagement technologies for detection and tracking of conventional and low cross section threats to increase weapon system lethality and survivability. <ul style="list-style-type: none"> – (U) Evaluated operational payoff of innovative tracking schemes by using real flight data in ground tests of algorithms. 									
Project 6095		Page 20 of 32 Pages				Exhibit R-2 (PE 0602204F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 6095
– (U) \$982	Develop sensor management technologies and innovative deployment tactics to increase air combat situational awareness, increase range, and improve high-confidence target identification.	
	– (U) Ground-tested and evaluated algorithms which fuse all available radar data for a more comprehensive target picture.	
	– (U) Evaluated sensor management technologies capable of integrating ownship sensor data and off-board data to improve situational awareness.	
	– (U) Evaluated candidate technologies that allow aircraft in the same flight to share information to promote commonality of fire control functions across various platforms.	
– (U) \$220	Develop innovative surface strike targeting techniques using all available (on-board and off-board) threat targeting information.	
	– (U) Designed targeting scheme that uses off-board information to aid in development of the fire control solution passed to the weapon.	
– (U) \$1,520	Develop advanced automatic target recognition algorithm techniques.	
	– (U) Integrated advanced feature extraction techniques to evaluate performance improvement in automatic target recognition.	
	– (U) Evaluated performance of automatic target recognition using advanced thermal invariance algorithms.	
	– (U) Demonstrated feasibility of multispectral infrared (IR) fusion of thermal, spatial, and motion features of threat aircraft.	
– (U) \$1,061	Develop advanced synthetic signature and scene generation capability to train automatic target recognition algorithms.	
	– (U) Integrated advanced IR target generation with scene generation capability.	
	– (U) Demonstrated high-fidelity, high-speed synthetic aperture radar signature and scene prediction.	
– (U) \$919	Develop analytical and empirical automatic target recognition modeling techniques to determine performance boundaries of automatic target recognition.	
	– (U) Used real and synthetic data to evaluate performance of automatic target recognition algorithm against multiple target types.	
– (U) \$1,569	Develop robust, ultra-high-range radar algorithms for both air-to-air and air-to-ground applications.	
	– (U) Demonstrated advanced, robust, ultra high-range radar algorithms in a laboratory environment.	
– (U) \$9,771	Total	
(U) FY 1998 (\$ in Thousands):		
– (U) \$2,218	Develop and evaluate multisensor management technologies to optimize search techniques, increase air combat situational awareness, increase detection ranges, allow high-confidence target identification, and enhance surface strike applications.	
	– (U) Complete evaluation of sensor management technologies capable of integrating ownship sensor data (offensive and defensive sensors) and off-board data to increase air combat situational awareness and provide all aspect fire control capability.	
	– (U) Refine targeting scheme for utilizing off-board information for final weapon solution.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 6095
– (U) \$2,496	Demonstrate rapid evaluation of multi-sensor system concepts to support all-aspect fire control, target tracking, and situation awareness.	
	– (U) Complete medium fidelity sensor models and preliminary performance measurement capabilities for multi-sensor testbed. Archive limited sets of actual sensor data for fusion concept evaluation.	
– (U) \$554	Apply emerging open software architecture standards and practices to the development and evaluation of real-time, on-board, adaptive information fusion systems for reduced targeting errors and enhanced situation awareness.	
	– (U) Design an architectural framework describing the functions, interfaces, and measures of performance for advanced information fusion systems.	
	– (U) Initiate development of avionics fusion architecture components in conjunction with fusion researchers from the Department of Defense, industry, and academia.	
	– (U) Establish baseline performance characteristics for avionics fusion applications and quantify the effects of reference system-related errors on fusion algorithms.	
– (U) \$1,220	Develop low-cost techniques using on-board sensors for cooperative air-to-ground identification of friendly forces to reduce fratricide and increase mission effectiveness.	
	– (U) Develop techniques and radar and infrared technologies necessary for existing aircraft to identify friendly ground forces.	
– (U) \$998	Develop advanced automatic target recognition (ATR) techniques.	
	– (U) Verify feasibility of integrating advanced synthetic aperture radar and passive radio frequency target generation capability.	
	– (U) Extract exploitable ‘signature fingerprints’ from high-range resolution and synthetic aperture radar data for use in target identification/synthetic model development.	
	– (U) Continue integration of advanced radar feature extraction techniques to evaluate performance improvement in radar ATR versus current approaches.	
	– (U) Evaluate performance enhancement of infrared (IR) ATRs using advanced thermal invariance algorithms.	
	– (U) Begin development of ATR algorithms which employ computational learning and invariant IR and radio frequency features to enhance the performance of radar, IR, and multispectral ATR systems.	
– (U) \$7,486	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$1,756	Develop, evaluate, and demonstrate air-to-air single and multisensor tracking, sensor management, fire control, situation awareness, and identification algorithms to dramatically improve air combat capability.	
	– (U) Develop advanced sensor fusion technologies for fighter aircraft to enable detection, tracking, and engagement of low-observable aircraft.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 6095
– (U) \$5,062	Develop, evaluate, and demonstrate air-to-ground single and multisensor tracking, sensor management, fire control, situation awareness, and identification algorithms to dramatically improve reconnaissance, surveillance, and strike operations.	
	– (U) Expand the multi-sensor fusion testbed capability by adding additional truth targets, additional sensor models, limited man-in-the-loop capability, and enhanced measures of performance.	
	– (U) Update and refine open system avionics architecture for real-time, embedded, adaptive information fusion systems.	
	– (U) Provide detailed design of an architectural framework describing the functions, interfaces, and measures of performance for advanced information fusion systems.	
	– (U) Continue to evaluate avionics information fusion architecture concepts in conjunction with fusion researchers from the Department of Defense, industry, and academia.	
	– (U) Continue development of techniques and supporting radar and infrared technologies necessary for existing aircraft to identify friendly ground forces.	
– (U) \$2,772	Develop, evaluate, and demonstrate feasibility of single and multisensor automatic target recognition (ATR) algorithms to dramatically improve capability to recognize hostile ground forces.	
	– (U) Demonstrate integration of advanced synthetic aperture radar and passive radio frequency (RF) target generation capability.	
	– (U) Demonstrate extraction of exploitable ‘signature fingerprints’ from high range resolution and synthetic aperture radar data for use in target identification.	
	– (U) Continue development of ATR algorithms which employ computational learning and invariant infrared and RF features to enhance the performance of radar, infrared, and multispectral ATR systems.	
– (U) \$1,216	Develop and demonstrate enabling technologies for long-range, high-altitude air and space vehicles.	
	– (U) Identify high-risk, high impact technologies needed to provide extremely high-altitude, long-range targeting and attack capabilities for space planes.	
– (U) \$800	Develop precision time, position, and velocity sensors for generating a common precision reference and to enable multiple platforms to share sensor data.	
	– (U) Develop and evaluate techniques for optimizing inertial sensors for integration with Global Positioning System (GPS) and inertial systems.	
	– (U) Design avionics fusion algorithms to quantify and improve the effects of reference-system-related errors.	
– (U) \$11,606	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602204F Aerospace Avionics				PROJECT 6096		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
6096 Microelectronics Technology	7,586	9,273	9,475	8,906	9,874	9,679	9,898	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project focuses on military unique, avionics aspects of microelectronics such as high-speed devices and circuits; packaging and power distribution; design tools; and hardware design languages. The warfighter requirements for technology developments are based on Air Force and other DoD weapon systems needs in the areas of radar, communications, electronic warfare, navigation, and smart weapons applications. Paramount to success is the development of high-speed analog-to-digital converter circuits, design, packaging, and power management support technologies that provide for the utilization of commercial-off-the-shelf products and military essential avionics devices and circuits. Computer-aided engineering technology is key to addressing the low-cost, very high performance, low power, tough environmental, multi-organization development, and high complexity challenges of our warfighting electronics. The developed technology is unavailable through commercial sources.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,892 Develop advanced integrated circuits, including analog to digital converter circuits, for military radio frequency (RF) and digital support electronics. <ul style="list-style-type: none"> - (U) Optimized devices and fabrication processes for a transceiver chip set to improve performance and reliability of digital support electronics. - (U) Fabricated and tested devices and integrated circuits for direct X-band analog-to-digital conversion to improve reliability and performance of radar support electronics. - (U) Designed and developed high-speed circuits to augment the capability of commercial circuits for processing complex RF signals. - (U) \$1,528 Develop surface protective coatings, distributed power management, microsensors, and digital engine control technology to improve the reliability of electronic subsystems. <ul style="list-style-type: none"> - (U) Evaluated advanced packaging techniques for the direct X-band analog-to-digital conversion to improve reliability and performance of radar support electronics. - (U) Designed and developed direct mount electronic engine control circuits that can withstand very high temperatures. - (U) Completed evaluation of an advanced surface-protective coating process for integrated circuits. - (U) \$1,574 Develop and integrate advanced design tools into a commercial software environment for affordable model year upgrades. <ul style="list-style-type: none"> - (U) Demonstrated a rapid design approach to interface avionics sensors with the processor. - (U) Developed a reuse library for aircraft electronics integrated circuit designs. 										
Project 6096		Page 25 of 32 Pages				Exhibit R-2 (PE 0602204F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 6096
<ul style="list-style-type: none"> - (U) \$1,592 - (U) \$7,586 	<p>Develop hardware design language technology for more effective control of obsolete parts and logistics costs for existing weapon systems.</p> <ul style="list-style-type: none"> - (U) Completed the digital hardware design language validation suite. - (U) Developed methods for mixing analog and digital models in the same validation suite. - (U) Continued development of reengineering support tools and electronics libraries for aging aircraft electronics suites. <p>Total</p>	
(U) <u>FY 1998 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$2,616 - (U) \$2,616 	<p>Develop advanced high-speed devices and fabrication processes for digital integrated circuits to allow high-speed military sensors to interface with slower commercial processing components, thereby, eliminating bulky, costly, and temperature-sensitive down-conversion electronics. These technologies include very high-speed analog-to-digital converter circuits, digital radio frequency memory chips, etc.</p> <ul style="list-style-type: none"> - (U) Demonstrate high-speed devices and fabrication processes for a transceiver chip set to improve performance and reliability of high dynamic range, high sensitivity receivers while achieving a factor of fifty reduction in size. - (U) Fabricate and test devices and integrated circuits for greater than ten gigahertz analog-to-digital conversion for radar and electronic warfare sensors with high sensitivity receivers. 	
<ul style="list-style-type: none"> - (U) \$1,744 	<p>Develop surface protective coatings, distributed power management, and packaging technologies for high performance digital integrated circuits to improve reliability and lower the cost of components that are required to operate in harsh military environments.</p> <ul style="list-style-type: none"> - (U) Develop high frequency, 100 megahertz power switching devices for modular avionics sensors to provide more efficient power conversion technology for advanced sensors such as phased array antennas and electronic warfare transmitters and receivers. 	
	<p>Develop and integrate advanced design tools into a commercial software environment for affordable model year upgrades.</p> <ul style="list-style-type: none"> - (U) Develop and demonstrate a second, more capable version of the software tools for on-the-fly reconfigurable computing for flexible mission profiles. - (U) Demonstrate utility of software tools for re-engineering/replacing electronic components that are obsolete or no longer manufactured. - (U) Complete development of extensive, portable library of reusable military integrated circuit designs to speed insertion of advanced technology. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	
		PROJECT 6096
– (U) \$2,297	Develop next-generation hardware design languages (HDLs) to enable more effective interchange of replacement part design information, better control of obsolete parts, and reduced logistics support costs.	
	– (U) Complete support documentation to promote digital and analog HDLs as industry standards.	
	– (U) Complete development of digital HDL training material and validation suite; transition to users (e.g., air logistics centers and system program offices).	
	– (U) Develop an improved version of the software tools for using both analog and digital HDLs for circuits with analog and digital components.	
– (U) \$9,273	Total	
(U) FY 1999 (\$ in Thousands):		
– (U) \$2,733	Develop advanced high-speed devices and fabrication processes for digital integrated circuits to allow high-speed military sensors to interface with slower commercial processing components, thereby, eliminating bulky, costly, and temperature-sensitive down-conversion electronics. These technologies include very high-speed analog-to-digital converter circuits, digital radio frequency memory chips, etc.	
	– (U) Continue to demonstrate high-speed devices and fabrication processes for a transceiver chip set to improve performance and reliability of high dynamic range, high sensitivity receivers while achieving a factor of fifty reduction in size.	
	– (U) Augment analog-to-digital conversion circuits to enable more extensive use of commercial-off-the-shelf components in radar, electronic warfare, and communications/navigation/identification sensors, thereby, reducing cost, weight, and volume.	
– (U) \$1,809	Develop surface protective coatings and packaging technologies for high performance, mixed analog/digital microwave circuits to improve reliability and lower the cost of components that must operate in harsh military environments.	
	– (U) Develop advanced packaging and interconnect processes applicable to advanced sensors such as phased array antennas and electronic warfare transmitters and receivers.	
– (U) \$2,212	Develop advanced design tools to reduce the cost and time required to create complex Air Force electronic systems.	
	– (U) Assess and refine tools for automating the design of next-generation electronic “systems-on-a-chip”.	
	– (U) Integrate algorithms with reconfigurable computing and high-level design automation tools for faster handling of battlefield information.	
– (U) \$2,721	Develop next-generation design languages to support the complexity in implementing the Air Force’s “system of systems” vision.	
	– (U) Develop extensions to the industry standard hardware description language to support modeling of complex information networks.	
	– (U) Develop design language tools for capturing complex military information system needs and constraints.	
– (U) \$9,475	Total	

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 6096
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	7,909	9,689	9,666	Cont
(U) Current Budget Submit/FY 1999 PB	7,586	9,273	9,475	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0602702F, Command, Control and Communications.
- (U) PE 0602705A, Electronics and Electronic Devices.
- (U) PE 0602234N, Materials, Electronics and Computers.
- (U) PE 0602712E, Materials and Electronics.
- (U) PE 0603739E, Manufacturing Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602204F Aerospace Avionics				PROJECT 7622				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
7622	Radio Frequency Sensor Technology			7,953	7,632	9,222	9,782	10,161	10,429	10,701	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Determines feasibility of technology for reliable, all-weather, reconnaissance and precision strike radio frequency sensors and information transfer systems. Emphasis is on: acquisition of surface and airborne targets with difficult to detect signatures due to reduced radar cross sections, concealment and camouflage measures, severe clutter, and/or heavy jamming; and satisfying the growing need to transmit data between aircraft with high integrity, low probability of detection, and high jam resistance. Assured low probability of detection communications are required to reduce aircraft physical and electromagnetic vulnerability and provide major improvements in strike effectiveness by eliminating the requirement for "no communications" operations.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,130 Develop advanced microwave sensor technology for air-to-air radar and target detection, including electronic protection, multi-dimensional image processing, and adaptive algorithms, that also explore reducing life cycle cost. <ul style="list-style-type: none"> - (U) Developed concept for an integrated analog/digital radio frequency system to reduce receiver hardware specifications and field maintenance. - (U) \$2,229 Develop tools and techniques that significantly reduce the cost and time to develop complex, synthetic, airborne radar environments. <ul style="list-style-type: none"> - (U) Developed user-friendly, automated, object-oriented programming system to allow ground controllers to maneuver synthetic aperture radar to penetrate foliage and mitigate hostile electromagnetic environments. - (U) \$2,267 Develop integrated radar/targeting engineering analysis tools to evaluate sensor targeting errors for front-line fighter aircraft. <ul style="list-style-type: none"> - (U) Established baseline radar analysis library with emphasis on user-friendly, automated, object-oriented and reusable software. - (U) \$253 Develop two-dimensional radar imaging technology for enhanced all aspect air-to-air target identification capability. <ul style="list-style-type: none"> - (U) Developed two-dimensional imaging technology to enhance front-line fighter first-look, first-kill capability. - (U) \$648 Develop technology to improve communication system electromagnetic interference rejection which in turn will provide the pilot more reliable communications in the combat environment. <ul style="list-style-type: none"> - (U) Completed development and evaluation of low-cost techniques to reduce radiated co-site interference for assured communications. - (U) \$747 Develop technology for short-range, low probability of detection, jam-resistant capabilities for voice communication and low-data-rate information exchange to eliminate the need for "comm out" operations and to increase survivability. <ul style="list-style-type: none"> - (U) Completed initial breadboard and laboratory tested joint Army/Air Force ultraviolet, non-line-of-site communications concept which will enable effective communications during nap-of-the-earth flight operations. - (U) Developed preliminary design and assessed radiated co-site interference for use of non-traditional communications capability. 												
Project 7622				Page 29 of 32 Pages				Exhibit R-2 (PE 0602204F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	
		PROJECT 7622
– (U) \$679	Develop technology for automation of cockpit communications to reduce pilot workload and increase the availability of communications during combat operations.	
	– (U) Completed design and began fabrication of a brassboard to demonstrate a voice-actuated expert system that will control cockpit communications.	
– (U) \$7,953	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$3,025	Develop advanced microwave sensor technology for air-to-air radar and target detection, including electronic protection, multi-dimensional image processing, and adaptive algorithms, to improve performance and also reduce life cycle cost.	
	– (U) Refine integrated radio frequency (RF) techniques to improve weapon systems performance, reduce RF system operating costs, and increase situational awareness in some operating environments.	
	– (U) Develop limited processing improvements of adaptive algorithms for terrain scattered interference cancellation, radome reflection lobe cancellation, and side/main lobe cancellation in advanced fighter aircraft radars.	
	– (U) Develop limited set of radar engineering analysis tools to evaluate sources of sensor targeting errors in front-line fighter aircraft.	
– (U) \$2,802	Develop advanced airborne sensors for air-to-ground targeting and attack with robust performance in adverse weather, severe jamming, natural clutter, or concealment by foliage or camouflage.	
	– (U) Develop targeting scenes, using improved analytical clutter generation, for limited evaluation of advanced synthetic aperture radar (SAR) sensors.	
	– (U) Develop limited capability to analyze advanced SAR sensors and predict their performance characteristics given particular system parameters, processing, target aspects, motion compensation systems, and targeting scenarios.	
– (U) \$1,805	Develop technology for information transmission between airborne vehicles and cooperating assets with high fidelity, low probability of detection, and high jam resistance to improve strike effectiveness.	
	– (U) Complete laboratory test of joint Army/Air Force ultraviolet, non-line-of-sight, communications concept which will enable effective communications during nap of the earth flight operations.	
	– (U) Design a hybrid radio frequency/electro-optical interference rejection filter to provide a three orders of magnitude increase in rejection of interfering signals while reducing size, weight, power, and cost of airborne communication receivers.	
	– (U) Continue fabrication and begin integration of an expert system brassboard that manages communication systems for assured communications.	
– (U) \$7,632	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 7622
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$3,621	Develop advanced microwave sensor technology for air-to-air radar and target detection, including electronic protection, multi-dimensional image processing, and adaptive algorithms, to improve performance and also reduce life cycle cost.	
	– (U) Perform laboratory testing of integrated radio frequency (RF) techniques to improve weapon systems performance, reduce RF system operating costs, and increase situational awareness in all operating environments.	
	– (U) Continue to develop limited processing improvements of adaptive algorithm for terrain scattered interference cancellation, radome reflection lobe cancellation, and side/main lobe cancellation in advanced fighter aircraft.	
	– (U) Continue to develop limited set of radar engineering analysis tools to evaluate sources of sensor targeting errors in front-line fighter aircraft.	
– (U) \$3,186	Develop advanced airborne sensors for air-to-ground targeting and attack with robust performance in adverse weather, severe jamming, natural clutter, or concealment by foliage or camouflage.	
	– (U) Continue to develop targeting scenes, using improved analytical clutter generation, for use in evaluation of advanced synthetic aperture radar (SAR) sensors.	
	– (U) Continue development of limited analytical tools to predict the performance characteristics of advanced SAR sensors given particular system parameters, target aspects, motion compensation systems, and targeting scenarios.	
– (U) \$2,415	Develop technology for information transmission between airborne vehicles and cooperating assets with high fidelity, low probability of detection, and high jam resistance to improve strike effectiveness.	
	– (U) Complete preliminary design of a hybrid radio frequency/electro-optical interference rejection filter to provide a three orders of magnitude increase in rejection of interfering signals while reducing size, weight, power, and cost of airborne communication receivers.	
	– (U) Complete integration of an expert system brassboard that manages communication systems for assured communications.	
– (U) \$9,222	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998	
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602204F Aerospace Avionics	PROJECT 7622		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
				<u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	7,976	8,016	9,407	Cont
(U) Current Budget Submit/FY 1999 PB	7,953	7,632	9,222	Cont
(U) Change Summary Explanation:				
Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.				
- (U) PE 0603253F, Advanced Avionics Integration.				
- (U) PE 0602782A, Command, Control and Communications (C3) Technology.				
- (U) PE 0602232N, Navy C3 Technology.				
- (U) PE 060379N, Advanced Technology Demonstration Program.				
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
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(U) D. <u>Schedule Profile:</u> Not Applicable.				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 2 - Applied Research			PE NUMBER AND TITLE 0602269F Hypersonic Technology Program					PROJECT 1025			
COST (\$ In Thousands)			FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1025	Hypersonic Technology		9,986	9,305	16,649	16,577	16,396	16,287	16,352	Continuing	Continuing
	Quantity of RDT&E Articles		0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Applied Research program develops advanced hypersonic technologies and will provide revolutionary technology options to satisfy future Air Force needs such as future hypersonic weapons and space launch concepts. This effort captures applicable hypersonic technologies from the National Aero-Space Plane (NASP) program. This program will focus on hydrocarbon fueled hypersonic vehicle technologies and demonstrate their feasibility. Technologies developed under this program will be dual-use and applicable to both DoD and NASA requirements. Planned efforts include analyses, hypersonic materials/structures, airbreathing propulsion, hydrocarbon fuels, and integrated technology test demonstrations. Development of hypersonic technologies was previously conducted under the National Aero-Space Plane (NASP) program and the Hypersonic Systems Technology Program (HySTP). In FY 1995, the Air Force canceled HySTP and refocused efforts into a hypersonic technology initiative. This required a major restructure of the program requiring Congressional approval. Note: The FY 1999 and out increase reflects additional emphasis on development of the hypersonic propulsion system.

(U) FY 1997 (\$ in Thousands):

- (U) 8,863 Designed, developed, and tested propulsion components, structures, and integrated propulsion designs for advanced hypersonic propulsion concepts.
 - (U) Completed investigation of advanced injection/flameholding technologies to optimize scramjet performance.
 - (U) Continued detailed design and fabrication of components for a scramjet engine (e.g., inlet, combustor, and nozzle) capable of demonstrating positive thrust at Mach 4-8 while withstanding the severe internal conditions.
 - (U) Determined foreign scramjet hardware performance potential through detailed analysis and test, and evaluated potential suitability to U.S. scramjets.
 - (U) Demonstrated endothermic fuel concepts to extend hydrocarbon-fueled scramjet capability from Mach 4-8 to Mach 10.
- (U) \$239 Designed, developed, and tested advanced high-temperature, high-strength materials and structures for hypersonic applications.
 - (U) Performed detailed characterization and testing of selected high-temperature, lightweight materials for the internal sections of hypersonic propulsion engines.
- (U) \$263 Developed technologies for instrumentation and test in realistic hypersonic conditions.
 - (U) Fabricated and experimentally verified hypersonic test instrumentation that can withstand and accurately sense internal flow conditions (e.g., temperature, pressure, heat flux, etc.) without disturbing airflow or engine operating conditions.
- (U) \$473 Developed and extended computational technologies from low-speed and supersonic flight to the hypersonic environment.
 - (U) Developed initial concepts to extend interdisciplinary computational fluid dynamics and vehicle thermal management modeling for an integrated design methodology to create an affordable hypersonic design.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602269F Hypersonic Technology Program	PROJECT 1025
– (U) \$148	Conducted feasibility studies, design trades, and simulations to integrate hypersonic technologies into advanced vehicle designs for hypersonic applications which will improve warfighting capability and satisfy the requirements of Global Reach/Global Power.	
	– (U) Conducted mission analyses to characterize user requirements and technology maturity.	
	– (U) Conducted detailed missile designs to guide technology requirements definition and development.	
– (U) \$9,986	Total	
(U) FY 1998 (\$ in Thousands):		
– (U) \$8,098	Design, develop, and test propulsion components, structures, and integrated propulsion designs for advanced hypersonic propulsion concepts.	
	– (U) Continue detailed design and initiate fabrication of test components for a scramjet engine (e.g., inlet, combustor, and nozzle) capable of demonstrating positive thrust at Mach 4-8 while withstanding the severe internal conditions.	
	– (U) Complete reverse engineering and component/subscale testing of foreign scramjet hardware to determine foreign design methodology. Determine need for further testing at larger scale.	
	– (U) Complete demonstration of endothermic fuel concepts to increase performance and alleviate flowpath temperatures in Mach 4-8 engine.	
– (U) \$471	Design, develop, and test advanced high-temperature, high-strength materials and structures for hypersonic applications.	
	– (U) Complete detailed characterization and testing of first set of down-selected high-temperature, lightweight materials for the internal sections of hypersonic propulsion engines.	
– (U) \$284	Develop technologies for instrumentation and test in realistic hypersonic conditions.	
	– (U) Continue fabrication and testing of hypersonic test instrumentation that can withstand and accurately sense internal flow conditions (e.g., temperature, pressure, heat flux, etc.) without disturbing airflow or engine operating conditions.	
– (U) \$310	Develop and extend computational technologies from low-speed and supersonic flight to the hypersonic environment.	
	– (U) Complete refinement of concepts to extend interdisciplinary computational fluid dynamics and vehicle thermal management modeling for an integrated design methodology to create an affordable hypersonic design. Initiate validation of computational methods in instrumented engine flowpath test rigs.	
– (U) \$142	Conduct feasibility studies, design trades, and simulations to integrate hypersonic technologies into advanced vehicle designs for hypersonic applications that will improve warfighting capability and satisfy the requirements of Global Reach/Global Power.	
	– (U) Continue mission analyses to characterize user requirements and technology maturity.	
	– (U) Refine detailed missile designs to guide inter-disciplinary technology requirements definition and development for integrated hypersonic vehicles.	
– (U) \$9,305	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602269F Hypersonic Technology Program	PROJECT 1025
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$14,655 Design, develop, and test propulsion components, structures, and integrated propulsion designs for advanced hypersonic propulsion concepts. <ul style="list-style-type: none"> – (U) Continue testing of scramjet engine components (e.g., inlet, combustor, and nozzle) capable of demonstrating positive thrust at Mach 4-8 while withstanding the severe internal conditions. – (U) Initiate detailed design of freejet test engine and initiate fabrication of components. – (U) Apply endothermic fuel concepts to specific designs of Mach 4-8 engines. – (U) \$1,063 Design, develop, and test advanced high-temperature, high-strength materials and structures for hypersonic applications. <ul style="list-style-type: none"> – (U) Initiate detailed characterization and testing of high-temperature, lightweight materials selected for the internal sections of specific engine configurations. – (U) \$392 Develop technologies for instrumentation and test in realistic hypersonic conditions. <ul style="list-style-type: none"> – (U) Apply hypersonic test instrumentation to specific freejet engine configurations and initiate establishment of test instrumentation protocol for freejet testing. – (U) \$392 Develop and extend computational technologies from low-speed and supersonic flight to the hypersonic environment. <ul style="list-style-type: none"> – (U) Continue validation of computational methods in instrumented engine flowpath test rigs. – (U) \$147 Conduct feasibility studies, design trades, and simulations to integrate hypersonic technologies into advanced vehicle designs for hypersonic applications that will improve warfighting capability and satisfy the requirements of Global Reach/Global Power. <ul style="list-style-type: none"> – (U) Continue mission analyses to characterize user requirements and technology maturity. – (U) Update detailed missile design to guide inter-disciplinary technology requirements definition and development for integrated hypersonic vehicles. – (U) \$16,649 Total 		
Project 1025	Page 3 of 4 Pages	Exhibit R-2 (PE 0602269F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602269F Hypersonic Technology Program	PROJECT 1025
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	7,153	9,840	12,984	Cont
(U) Appropriated Value	7,471	9,840		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-156	-326		
b. SBIR	-162	-209		
c. Omnibus/Other Above Threshold Reprogrammings	-157			
d. Below Threshold Reprogrammings	3,000			
e. Rescissions	-10			
(U) Adjustments to Budget Years Since FY 1998 PB			3,665	
(U) Current Budget Submit/FY 1999 PB	9,986	9,305	16,649	Cont

(U) **Change Summary Explanation:**

Funding: Changes to this PE since the previous President's Budget are due to increased support of the program schedule.

Schedule: FY 1999 and out increase will return the program to the original demonstration time frame in FY 2003.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

- (U) Related Activities:
- (U) PE 0602102F, Materials.
 - (U) PE 0602201F, Flight Dynamics.
 - (U) PE 0602203F, Aerospace Propulsion
 - (U) PE 0603112F, Advanced Materials for Weapon Systems.
 - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	138,483	118,266	116,139	131,078	138,457	141,412	143,492	Continuing	Continuing
1010 Geophysics and Weather Technology	25,322	20,321	15,457	16,349	16,736	16,134	16,609	Continuing	Continuing
1011 Rocket Propulsion Technology	32,651	29,407	35,542	37,121	38,456	37,733	37,575	Continuing	Continuing
3326 Lasers and Imaging Technology	16,771	18,485	19,376	20,096	19,924	20,525	20,815	Continuing	Continuing
5797 Advanced Weapons and Survivability Technology	14,072	14,468	14,645	15,834	16,159	16,779	17,188	Continuing	Continuing
8809 Space and Missile Technology	49,667	35,585	31,119	41,678	47,182	50,241	51,305	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This is the Applied Research program for space technology, rocket propulsion, and directed energy for the Air Force Research Laboratory. In geophysics, this PE develops technologies to understand, mitigate, and exploit effects of weather and geophysics environments on the design and operation of Air Force systems. This includes defining, modeling, and developing techniques to predict the phenomena of solar and space environments. In rocket propulsion, this PE develops technologies for boost and orbit transfer, satellite maneuvering, and tactical/ballistic missile rocket propulsion. In lasers, this PE examines the technical feasibility of moderate to high power lasers, associated optical components, and long-range optical imaging concepts required for Air Force missions. Technologies researched include high power laser devices, mid-infrared semiconductor laser devices, semiconductor diode laser arrays, optical components, advanced beam control and atmospheric compensation technologies, techniques for laser target vulnerability assessments, and nonlinear optics processes and techniques. Advanced weapons examines high power microwave and other unconventional weapon concepts using innovative technologies such as compact toroids. This also provides for vulnerability assessments of representative U.S. strategic and tactical systems to directed energy weapons, directed energy weapon technology assessment for specific Air Force missions, and directed energy weapon lethality assessments against foreign targets. In space and missiles, this PE develops the following technologies: spacecraft platform (e.g., structures, controls, power, and thermal management); space-based payload (e.g., sensors, satellite communications, and survivable electronics); satellite control (e.g., spacecraft software); ballistic missile/launch vehicle-specific (e.g., astrodynamics and guidance, navigation, and control avionics); and integrated experiments of advanced technologies for transition to planned systems (e.g., payload/platform/launch vehicle merging). Note: Congress added \$20.75 million in FY 1997 (Project 1010, \$5.0 million for High Frequency Active Auroral Research Program (HAARP); Project 1011, \$4.75 million for Integrated High Payoff Rocket Propulsion Technology (IHRPT); and Project 8809, \$6.0 million for Phase III terabit fiber optic technology and \$5.0 million for MightySat) which explains the perceived decrease in FYs 1998 and 1999. Also, the emphasis on Geophysics and Weather Technology has been decreased, while additional emphasis has been placed on space and associated technologies.

Page 1 of 38 Pages Exhibit R-2 (PE 0602601F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development			
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
				<u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	147,712	111,136	123,514	Cont
(U) Appropriated Value	153,507	127,259		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-3,417	-7,390		
b. SBIR	-1,916	-1,603		
c. Omnibus/Other Above Threshold Reprogrammings	-8,228			
d. Below Threshold Reprogrammings	-1,179			
e. Rescissions	-284			
(U) Adjustments to Budget Year Since FY 1998 PB			-7,375	
(U) Current Budget Submit/FY 1999 PB	138,483	118,266	116,139	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development				PROJECT 1010	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1010 Geophysics and Weather Technology	25,322	20,321	15,457	16,349	16,736	16,134	16,609	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops the technologies to understand, mitigate, and exploit the effects of the weather and geophysics environments on the design and operation of Air Force systems. This includes defining, modeling, and developing techniques to predict the phenomena of solar and space environments. Models are developed to specify and predict optical and infrared backgrounds and signatures of spacecraft and missiles, as well as techniques to predict when and where ionospheric disturbances will occur. New techniques for measuring, modeling, simulating, and predicting those environmental effects that impact the Air Force mission are investigated.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,290 Developed techniques to specify and predict the space environment for space system design and operations. <ul style="list-style-type: none"> - (U) Designed sensors for detecting/characterizing space particle populations that degrade and destroy satellite electronic components/subsystems, thereby, reducing mission lifetimes and raising system costs. - (U) Designed optical tracking experiment for solar coronal ejections to provide first-warning of space disturbances that cause spacetrack errors and false launch indicators in infrared (IR) and radar warning sensors. - (U) Developed/validated a solar flare forecast theory to improve warning notices to spacecraft operators. - (U) Developed/transitioned solar shock-front transit model to 55th Space Weather Squadron (SWS), improving warning capability to one hour. - (U) \$3,151 Developed atmospheric optical background clutter prediction techniques to support Space Based Infrared System/Defense Surveillance Program (SBIRS/DSP). <ul style="list-style-type: none"> - (U) Completed code for use in SBIRS systems engineering phase that specifies the high-altitude atmospheric background clutter environment encountered during endo-atmospheric target intercepts. - (U) \$2,013 Developed active/passive remote sensing techniques for identifying aircraft and missile target signatures and specifying atmospheric wind profiles needed to improve ordnance delivery. <ul style="list-style-type: none"> - (U) Expanded/validated spectral in-band radiance images of aircraft/missile targets and scenes using Flying Infrared Signatures Technology Aircraft (FISTA) aircraft data. 									
Project 1010	Page 3 of 38 Pages					Exhibit R-2 (PE 0602601F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY 2 - Applied Research		February 1998
PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development		PROJECT 1010
<ul style="list-style-type: none"> - (U) \$4,152 Developed ionospheric specification and forecast techniques for communications, surveillance, navigation, and space system applications. <ul style="list-style-type: none"> - (U) Incorporated a wideband scintillation statistical model into Scintillation Network Decision Aid (SCINDA) to improve the reliability of satellite communication and warnings of Global Positioning System (GPS) disruptions. - (U) Delivered coupled ionospheric/thermosphere specification model to Air Weather Service to support the 55th Space Weather Squadron (SWS). - (U) Added plasmaspheric populations of hydrogen and helium ions to the Paramaterized Real-Time Ionospheric Specification Model (PRISM) needed to expand its operational utility to higher altitude orbital planes (from 6000 km to geosynchronous earth orbit). - (U) Demonstrated Scintillation Network Decision Aid (SCINDA) technique that exploits real-time ionospheric scintillation data to specify ionospheric disturbances that disrupt Ultra High Frequency (UHF) satellite communication and GPS. - (U) \$7,500 Evaluated the interaction between high power, high-frequency, ground transmitted radio waves and the ionosphere. <ul style="list-style-type: none"> - (U) Augmented, from 360 kilowatt (kW) towards 960 kW, the power of the High Frequency Active Auroral Research Program's (HAARP) transmitter in Alaska, enabling an expanded class of experiments for demonstrating advanced DoD system concepts. - (U) Conducted initial research on generating in the ionosphere Extremely Low Frequency/Very Low Frequency (EHF/VLF) radio waves for potential communications and underground structure/bunker imaging applications. - (U) \$4,216 Developed global and theater weather analysis, simulation, and prediction techniques for combat weather system applications. <ul style="list-style-type: none"> - (U) Delivered theater-scale analysis procedures for combat weather displays and theater weather forecast model initialization to Air Weather Service. - (U) \$25,322 Total 		
(U) <u>FY 1998 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$4,016 Develop space radiation specification and solar hazard prediction techniques for space system design and operations. <ul style="list-style-type: none"> - (U) Transition increased accuracy radiation belt models to U.S. Air Force system program offices and industry for more survivable satellite designs, orbit selection, trade offs, and reduced outage operations. - (U) Complete initial assessment on the threat of using space particles for both defensive and offensive counterspace activities. - (U) Fabricate space experiment to optically track coronal mass ejections from the sun to near earth space where they can trigger geomagnetic disturbances that cause false launch indicators, satellite tracking errors, and communications disruptions. - (U) Develop magnetic diffusion model for the evolution of active regions on the solar surface, required to forecast the occurrence of solar flares that can disrupt space systems and operations. - (U) Transition data driven solar wind model to 55th Space Weather Squadron for operational use in providing one hour warnings of interplanetary shocks that can trigger geomagnetic disturbances, disrupting space systems and operations. 		
Project 1010	Page 4 of 38 Pages	Exhibit R-2 (PE 0602601F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602601F Phillips Laboratory Exploratory Development	1010
<ul style="list-style-type: none"> – (U) \$2,943 Develop background clutter mitigation techniques for space system design and operations. <ul style="list-style-type: none"> – (U) Incorporate Mid-course Space Experiment (MSX) and Miniature Sensor Technology Integration (MSTI-3) satellite data into atmospheric background clutter codes MSX space system clutter processing. – (U) Develop hyperspectral background clutter suppression and target identification methods for space surveillance with tactical applications. – (U) \$1,385 Develop active and passive remote sensing techniques for atmospheric parameter measurements. <ul style="list-style-type: none"> – (U) Use advanced modeling and simulation technologies to provide real-time target and background scene generation capability for training and hardware-in-the-loop simulations – (U) Terminate development of compact solid state wind sensing lidar for ballistic wind applications (e.g., cargo drops and B-52 bomb drops). – (U) Terminate evolution of lidar designs for remote sensing of atmospheric optical and wind turbulence for aircraft safety and surveillance systems. – (U) \$3,458 Develop global ionospheric models for applications to communications and navigation systems. <ul style="list-style-type: none"> – (U) Transition Global Ionospheric Forecast models to 55 Space Weather Squadron for operational support to Command, Control, Communications, and Intelligence (C3I) systems, the SPACETRACK-space/object tracking system, and ground-based surveillance radars. – (U) Demonstrate a ground-based scintillation network decision aid (SCINDA) to provide theater specifications of ionospheric disturbances that cause ultra-high frequency (UHF) satellite communication outages, Global Positioning System (GPS) navigation degradations. – (U) Explore and demonstrate space-based techniques to provide a global forecast of ionospheric disturbances that cause miltatcom outages and GPS degradation. – (U) \$5,000 Characterize the ionospheric Extremely Low Frequency/Very Low Frequency (ELF/VLF) signal generation process. <ul style="list-style-type: none"> – (U) Expand the scope of research by fielding an array of ELF/VLF receivers and adding off-site diagnostics to determine source properties, and provide real-time communication, processing, display and Internet distribution of data. – (U) Improve the research infrastructure by completing the operations center in the power plant building, for centralized transmitter control and diagnostic instrument data display. 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	
		PROJECT 1010
<ul style="list-style-type: none"> - (U) \$3,519 - (U) \$20,321 	<p>Develop global and theater weather analysis, simulation, and prediction techniques for combat weather system applications including Airborne Laser (ABL).</p> <ul style="list-style-type: none"> - (U) Complete validation of satellite data, unified retrieval method to support theater weather forecast models. - (U) Incorporate satellite-based cloud module into simulation procedures for system design and testing. - (U) Terminate development of a method to incorporate satellite weather data into combat weather support forecast modules. <p>Total</p>	
(U) <u>FY 1999 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$3,944 - (U) \$3,369 - (U) \$1,599 	<p>Develop techniques to specify and predict the space environment for space system design and operations.</p> <ul style="list-style-type: none"> - (U) Develop model to forecast coronal mass ejections (CME) and fabricate space experiment to optically track CMEs from sun to earth providing three-to-seven day warning of geomagnetic disturbances. - (U) Add alert capability to three-dimensional space environment models used to warn operators, launch crews and users of space systems of conditions detrimental to their mission performance. - (U) Validate space storm model for predicting spacecraft charging that creates satellite outages and system failures. - (U) Develop physics-based solar wind model to provide a one to three day warning of interplanetary shocks that trigger geomagnetic disturbances causing false missile launch indicators, satellite tracking errors, and communication disruptions. - (U) Complete magnetic diffusion model of the evolution of active regions on the solar surface, required to predict the occurrence of solar flares that disrupt space systems and operations with emphasis on preparing for Solar Max (periods of maximum relative solar activity). <p>Develop background clutter mitigation techniques for adaptive hyperspectral space system design.</p> <ul style="list-style-type: none"> - (U) Develop optical background clutter models for detecting and tracking dim targets, including missiles. - (U) Develop real-time background clutter codes for target tracking satellite operations. <p>Develop active and passive remote sensing techniques for atmospheric parameter measurements and simulation of battlefield environments.</p> <ul style="list-style-type: none"> - (U) Demonstrate and validate design concepts for real-time target and background scene generation capability. - (U) Test and evaluate solid-state wind sensing lidars for B-52 applications. - (U) Develop compact, solid-state ultraviolet differential absorption lidar for trace gas and chemical detection for use on aircraft. 	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602601F Phillips Laboratory Exploratory Development	1010
<ul style="list-style-type: none"> - (U) \$5,545 Develop ionospheric specification and forecast techniques for communications, surveillance, navigation, and space system applications. <ul style="list-style-type: none"> - (U) Develop coupled Ionosphere-Thermosphere-Electrodynamics forecast model (CITEFM) for transition to 55th Space Weather Squadron for operational support of communications, surveillance, navigation, and space-object tracking users. - (U) Deliver validated real-time, data driven, Scintillation Network Decision Aid (SCINDA) techniques to 55th Space Weather Squadron to provide specification and advance warning of ionospheric disturbed conditions (scintillation) that cause Ultra-High Frequency (UHF)/L-Band satellite communication outages and Global Positioning System (GPS) navigation disruption. - (U) Explore and demonstrate space-based techniques to provide global forecasts of ionospheric disturbances that cause UHF satellite communication outages and GPS navigation degradations. - (U) \$1,000 Develop global and theater weather analysis, simulation and prediction techniques for combat weather systems applications. <ul style="list-style-type: none"> - (U) Tailor numerical weather prediction models to forecast contrails for stealth aircraft operations. - (U) Develop radiative cloud module for weather scene simulation techniques for training and wargaming applications. - (U) \$15,457 Total 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 1010																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 15%;"><u>FY 1997</u></th> <th style="text-align: center; width: 15%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">25,744</td> <td style="text-align: center;">16,507</td> <td style="text-align: center;">19,076</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">25,322</td> <td style="text-align: center;">20,321</td> <td style="text-align: center;">15,457</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0305160F, Defense Meteorological Satellite Program. - (U) PE 0601102F, Defense Research Sciences. - (U) PE 0602204F, Aerospace Avionics. - (U) PE 0603410F, Space Systems Environmental Interactions Technology. - (U) PE 0603707F, Weather Systems Advanced Development. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	25,744	16,507	19,076	Cont	(U) Current Budget Submit/FY 1999 PB	25,322	20,321	15,457	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	25,744	16,507	19,076	Cont														
(U) Current Budget Submit/FY 1999 PB	25,322	20,321	15,457	Cont														
Project 1010	<i>Page 8 of 38 Pages</i>		Exhibit R-2 (PE 0602601F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 1011
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1011 Rocket Propulsion Technology	32,651	29,407	35,542	37,121	38,456	37,733	37,575	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: The technologies developed in this project are boost and orbit transfer, satellite maneuvering, and tactical and ballistic missile rocket propulsion. This project develops technologies and provides technology options for rocket propulsion advanced demonstrations, components, or subsystems. Technologies of interest are those which will improve reliability, operability, survivability, affordability, environmental compatibility, and performance of future space and missile launch sub-systems while reducing material, manufacturing, and support costs. Technology will be developed to reduce the weight and cost of components using new materials, improved designs, and improved manufacturing techniques. All efforts in this project are part of the Integrated High Payoff Rocket Propulsion Technology (IHRPT) initiative; a joint Department of Defense, NASA, and industry effort to focus rocket propulsion technology on national needs.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,253 Developed high-energy-density materials.
 - (U) Completed analysis of solid hydrogen and metallic clusters, metal atom doped cryogenic solids, and solids with impurities. Transitioned the best high-energy-density materials into the cryogenic solid properties and combustion programs. Began testing and evaluation of downselected propellants to transition into future high-performance boost and orbit transfer propulsion systems.
 - (U) Finished exploring cryogenic solid, high-pressure solid, and extended solid properties. Determined candidates for cryogenic solid combustion programs that will show revolutionary performance increases by replacing current liquid or solid propulsion systems with cryogenic solid or hybrid-fuel rockets in future space launch missions.
 - (U) Developed techniques to accurately measure high-energy-density additive concentrations in cryogenic solids to maximize future propulsion system performance.
 - (U) Tested fire cryogenic hybrid-fuel rocket using oxygen and a cryogenic hydrocarbon to demonstrate performance increases over current liquid propulsion systems.
 - (U) Performed large-scale engine tests/demonstrations with new additives (quadricyclane). Prepared for launch-size demonstrations and began transitioning additives into system-ready applications.
 - (U) Completed strained-ring hydrocarbon high-energy compound development. Identified the best candidates for a scale-up program to replace current liquid fuels.
 - (U) Selected solid, non-ozone depleting oxidizers and other synthesized, new, high-energy-density materials for development. Began small-scale demonstrations of environmentally-safe solid rocket motor fuel processing using these new ingredients.

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BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
**0602601F Phillips Laboratory Exploratory
Development**

- (U) \$3,134 Developed propulsion technologies for tactical missile system applications.
 - (U) Tested fabrication techniques to manufacture lightweight solid rocket engine liners.
 - (U) Completed testing and demonstration of environmentally safe, minimum-smoke propellants to eliminate vulnerability caused by exhaust plume signature tracking.
 - (U) Developed the fabrication processes for novel nozzle concepts (supersonic splitline flexseal nozzle) that reduce missile weight while increasing missile agility.
 - (U) Evaluated commercial technologies and practices for their possible incorporation into low-cost, high-performance, environmentally-safe tactical missiles.
 - (U) Analyzed new propellants and components to develop a lightweight, highly-maneuverable propulsion system that will assure high kill ratios against the next generation of highly maneuverable aircraft.
 - (U) Continued development of hybrid propulsion systems for potential use as a tactical missile.
- (U) \$14,390 Developed propulsion technology to meet the needs of reliable, safe, and low-cost boost and orbit transfers.
 - (U) Demonstrated low-cost, high temperature, non-erosive, lightweight coated carbon-carbon ceramic and hybrid polymer components for use in solid rocket space launch and missile motors.
 - (U) Demonstrated the fluid film bearing designs and verified their performance and integrity when used in liquid turbopumps on future boost and orbit transfer systems.
 - (U) Designed and tested injectors that enable reduced cost, increased reliability, and increased engine performance in liquid boost and orbit transfer engines.
 - (U) Fabricated and tested a high-performance, low-cost cryogenic upper stage combustion chamber for an expander cycle application.
 - (U) Fabricated and tested an advanced preburner engine component that uses using liquid cryogenic propellants that meets the high throttling requirements and does not vaporize propellants.
 - (U) Continued to characterize new materials and developed processes required to apply the materials to liquid-propellant rocket production with dramatic weight reductions.
 - (U) Developed design and processing techniques for high-strength, low-weight engine and motor components (metals and non-metals).

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	
		PROJECT 1011
– (U) \$6,499	<p>Developed advanced boost and orbit transfer propellants which are environmentally safe during manufacture, storage, and use.</p> <ul style="list-style-type: none"> – (U) Evaluated ignition characteristics, determine combustion efficiencies, and report the results of the synthesized non-toxic, non-cryogenic, high-performance, storable liquid fuels and oxidizers to begin developing a high-performance, environmentally safe, liquid replacement for current space launch systems. – (U) Fabricated and tested non-toxic, non-cryogenic, high-performance, storable liquid additives for use with these new propellants (capable of withstanding the firing conditions created by the new propellants). – (U) Determined alternative disposal procedures/technologies to thermolyze or breakdown propellant, explosive, and pyrotechnic wastes into their non-hazardous constituent parts. – (U) Integrated all of the current solid propellant work being done under the high-energy-density materials program and incorporated the most promising chemicals into state-of-the-art propellants (liquid, solid, and hybrid). – (U) Evaluated and analyzed radically new methods of solid rocket motor and propellant manufacturing to develop low-cost, environmentally friendly solid rocket motors that exceed the performance of current liquid propellant rockets. – (U) Scaled-up and demonstrated the most innovative high-energy chemicals that are currently being synthesized within government and contractor laboratories. The most promising chemicals (solid or liquid) will be fed into an innovative propellants project to be used in next generation propellants for space launch systems. 	
– (U) \$2,525	<p>Developed techniques for use in sustainment of strategic systems while at the same time being potentially advantageous to the development of the next generation booster.</p>	
– (U) \$3,850	<p>Developed satellite propulsion technology for control and on-orbit transfer.</p> <ul style="list-style-type: none"> – (U) Developed and evaluated improved designs to fabricate a pulsed plasma thruster with increased power efficiency. – (U) Designed solar thrusters and concentrators for satellite propulsion systems with longer life. – (U) Developed and improved technologies for implementation of the high power Hall thruster. 	
– (U) \$32,651	<p>Total</p>	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 1011
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,442 Develop propellants with a high-energy density. <ul style="list-style-type: none"> - (U) Continue testing and evaluation of downselected propellants to transition into future high-performance boost and orbit transfer propulsion systems. These potential propellants were selected from the previously conducted analysis of solid hydrogen and other cryogenic solids, doped with high energy impurities such as atoms and dimers of lightweight elements and metals. - (U) Begin sub-scale testing of potential candidates for cryogenic solid combustion programs that will show revolutionary performance increases by replacing current liquid or solid propulsion systems with cryogenic solid or hybrid-fuel rockets in future space launch missions. - (U) Build low temperature hazards testing apparatus with capability to test energetic cryosolids as well as propellants at cold temperatures they might experience in field applications. - (U) Continue testing and comparison of techniques to accurately measure high energy-density additive concentrations in cryogenic solids to maximize future propulsion system performance. - (U) In collaboration with NASA, scale up selected energetic hydrocarbons for further testing in larger quantities. - (U) Begin new energetic hybrid rocket fuels development - (U) Continue selection of solid, non-ozone depleting oxidizers and other synthesized, new, high energy-density materials for development. Continue small-scale demonstrations of environmentally-safe solid rocket motor fuel processing using these new ingredients. 		
Project 1011	Page 12 of 38 Pages	Exhibit R-2 (PE 0602601F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602601F Phillips Laboratory Exploratory Development	1011
<ul style="list-style-type: none"> - (U) \$14,998 Develop propulsion technology for reliable, safe, and low-cost boost and orbit transfers. <ul style="list-style-type: none"> - (U) Continue to demonstrate low-cost, high temperature, non-erosive, lightweight coated carbon-carbon ceramic and hybrid polymer components for use in solid rocket space launch and missile motors. - (U) Complete fabrication and testing of an advanced preburner engine component that uses using liquid cryogenic propellants that meets the high throttling requirements and does not vaporize propellants. - (U) Complete demonstration of the fluid film bearing designs and verify their performance and integrity when used in liquid turbopumps on future boost and orbit transfer systems. - (U) Complete fabrication and test of a high-performance, low-cost cryogenic upper stage combustion chamber for an expander cycle application. - (U) Continue to characterize new materials and develop processes required to apply the materials to liquid-propellant rocket production with dramatic weight reductions. - (U) Continue to develop design and processing techniques for high-strength, low-weight engine and motor components (metals and non-metals). - (U) Continue development of altitude compensating thrust chamber assembly technology improvements which will provide significant gains in performance for reusable launch vehicles. - (U) \$3,601 Develop advanced boost and orbit transfer propellants which are environmentally safe during manufacture, storage, use, and disposal. <ul style="list-style-type: none"> - (U) Complete fabrication of spacecraft thruster and begin using it for evaluation of high energy monopropellant candidates. - (U) Continue the fabrication and testing of non-toxic, non-cryogenic, high-performance, storable liquid additives for use with the above new propellants (capable of withstanding the firing conditions created by the new propellants). - (U) Begin research and development of pulsed detonation rocket engine. -- (U) \$6,000 Develop technologies for use in long-term sustainment of strategic systems while at the same time being potentially advantageous to the development of the next generation booster. <ul style="list-style-type: none"> - (U) Begin development of compatible case/liner and insulator system for higher combustion temperature propellants to be used in strategic systems. - (U) Begin development of tools to increase the look-ahead capability in determining the age life of strategic and other solid rocket motors. - (U) Begin development of improved and replacement propellants and materials for both solid and liquid postboost control systems for application to strategic missiles with the purpose of developing technologies that are more readily available over the life of strategic systems (i.e., 20+ years). 		
Project 1011	<i>Page 13 of 38 Pages</i>	Exhibit R-2 (PE 0602601F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 1011
<ul style="list-style-type: none"> - (U) \$1,366 - (U) \$29,407 	<ul style="list-style-type: none"> Develop propulsion technology for satellite control and on-orbit transfer. <ul style="list-style-type: none"> - (U) Continue the Hall thruster development for possible inclusion into the next generation satellites. - (U) Continues work in the development and evaluation of improved designs to fabricate pulsed plasma thrusters with increased power efficiency, the next level of improvements. - (U) Continue the design and test of solar thrusters and concentrators for satellite propulsion systems with longer life. Total 	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,762 	<ul style="list-style-type: none"> Develop propellants with a high-energy density. <ul style="list-style-type: none"> - (U) Continue testing and evaluation of downselected propellants to transition into future high-performance boost and orbit transfer propulsion systems. These potential propellants were selected from the previously conducted analysis of solid hydrogen and other cryogenic solids, doped with high energy impurities such as atoms and dimers of lightweight elements and metals. - (U) Begin sub-scale testing of potential candidates for cryogenic solid combustion programs that will show revolutionary performance increases by replacing current liquid or solid propulsion systems with cryogenic solid or hybrid-fuel rockets in future space launch missions. - (U) Continue testing and comparison of techniques to accurately measure high energy-density additive concentrations in cryogenic solids to maximize future propulsion system performance. - (U) Complete performance of large-scale engine tests/demonstrations with new additives (quadricyclane). Continue preparation for launch-size demonstrations and transitioning additives into system-ready applications. - (U) Begin evaluation of next generation of hydrocarbon fuel additives to improve the performance of current and future space launch systems. - (U) Continue selection of solid, non-ozone depleting oxidizers and other synthesized, new, high energy-density materials for development. Continue small-scale demonstrations of environmentally-safe solid rocket motor fuel processing using these new ingredients. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602601F Phillips Laboratory Exploratory Development	1011
<ul style="list-style-type: none"> – (U) \$2,985 Develop propulsion technologies for tactical missiles. <ul style="list-style-type: none"> – Continue scale-up of minimum smoke propellant formulations which reduce system vulnerability due to exhaust plume signature. Continued exploration of nozzle and insulation materials that are compatible with the above propellants. Coordination with Navy and Army tactical missile programs is extensive. – Continue development of hybrid propulsion as part of an international cooperative project to develop this propulsion technology for application to tactical missiles. This is technology can provide very significant increases in range and average velocity and is coordinated extensively with Navy and Army programs. – (U) \$7,616 Develop propulsion technology for reliable, safe, and low-cost boost and orbit transfers. <ul style="list-style-type: none"> – (U) Continue to demonstrate low-cost, high temperature, non-erosive, lightweight coated carbon-carbon ceramic and hybrid polymer components for use in solid rocket space launch and missile motors. – (U) Complete demonstration of the fluid film bearing designs and verify their performance and integrity when used in liquid turbopumps on future boost and orbit transfer systems. – (U) Complete fabrication and test of a high-performance, low-cost cryogenic upper stage combustion chamber for an expander cycle application. – (U) Continue to characterize new materials and develop processes required to apply the materials to liquid-propellant rocket production with dramatic weight reductions. – (U) Continue to develop design and processing techniques for high-strength, low-weight engine and motor components (metals and non-metals). – (U) Continue development of altitude compensating thrust chamber assembly technology improvements which will provide significant gains in performance for reusable launch vehicles. – (U) Verify performance and weight improvements of rapid densification nozzle technology using improved strategic propellants for future ballistic missiles. – (U) \$10,093 Develop advanced boost and orbit transfer propellants which are environmentally safe during manufacture, storage, use, and disposal. <ul style="list-style-type: none"> – (U) Continue the evaluation of ignition characteristics, determine combustion efficiencies, and report the results of the synthesized non-toxic, non-cryogenic, high-performance, storable liquid fuels and oxidizers to begin developing a high-performance, environmentally safe, liquid replacement for current space launch systems. – (U) Continue the fabrication and testing of non-toxic, non-cryogenic, high-performance, storable liquid additives for use with the above new propellants (capable of withstanding the firing conditions created by the new propellants). – (U) Continue research and development of pulsed detonation rocket engine. 		
Project 1011	Page 15 of 38 Pages	Exhibit R-2 (PE 0602601F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	
PROJECT 1011		
<ul style="list-style-type: none"> – (U) \$8,000 – (U) \$3,086 – (U) \$35,542 	<ul style="list-style-type: none"> Develop technologies for use in long-term sustainment of strategic systems while at the same time being potentially advantageous to the development of the next generation booster. <ul style="list-style-type: none"> – (U) Continue development of compatible case/liner and insulator system for higher combustion temperature propellants to be used in strategic systems. – (U) Continue development of tools to increase the look-ahead capability in determining the age life of strategic and other solid rocket motors. – (U) Continue development of improved and replacement propellants and materials for both solid and liquid postboost control systems for application to strategic missiles with the purpose of developing technologies that are more readily available over the life of strategic systems (i.e., 20+ years). Develop propulsion technology for satellite control and on-orbit transfer. <ul style="list-style-type: none"> – (U) Continue work in the development and evaluation of improved designs to fabricate pulsed plasma thrusters with increased power efficiency. – (U) Continue the design and test of solar thrusters and concentrators for satellite propulsion systems with longer life. Total 	
Project 1011	<i>Page 16 of 38 Pages</i>	Exhibit R-2 (PE 0602601F)

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 3326
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3326 Lasers and Imaging Technology	16,771	18,485	19,376	20,096	19,924	20,525	20,815	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project examines the technical feasibility of moderate to high power lasers, associated optical components, and long-range optical imaging concepts required for Air Force missions. Technologies researched include advanced, short-wavelength laser devices for application as illuminators and imaging sources as well as advanced optical imagers for target identification and assessment. Laser technologies will be studied for their utility in aimpoint selection, target maintenance, and damage assessment. Additionally, high power laser devices, mid-infrared semiconductor laser devices, semiconductor diode laser arrays, optical components, advanced beam control and atmospheric compensation technologies, techniques for laser target vulnerability assessments, and nonlinear optics processes and techniques are developed.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,625 Developed generic, high energy laser technologies for applications such as illuminators for use in wavelength-specific military missions.
 - (U) Demonstrated lasing at 5.1 microns for a semiconductor laser.
 - (U) Demonstrated a three-pass stable resonator concept and produced a single mode, five kilowatt continuous wave beam.
 - (U) Demonstrated production of nitrogen chloride and scaling potential of atomic-iodine laser.
 - (U) Developed the magnetic gain switch hardware necessary to demonstrate a ten kilohertz repetitively pulsed chemical oxygen-iodine laser.
 - (U) Demonstrated a continuous-wave, single-frequency portable laser.
 - (U) Completed a laser illuminator study to meet future Air Force requirements.
- (U) \$1,013 Developed basic laser source and targeted coupling technology for use in high-payoff applications such as infrared countermeasures and creating laser-induced microwave effects.
 - (U) Completed field test series which demonstrated capabilities of concept over extended ranges.
 - (U) Developed two mid-infrared lasers operating at three and four microns for infrared countermeasures use.
 - (U) Completed experiment and analysis to assess the effectiveness of laser-induced microwave emissions in military applications; results provided a database on a novel effect used for upsetting electronic systems.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 3326
– (U) \$2,320	<p>Developed long-range optical imaging technologies for increased resolution and data fusion to support missions such as space object identification and ground target identification from space.</p> <ul style="list-style-type: none"> – (U) Conducted initial development of experiments on active and passive spectral technologies which increase performance and reduced cost of space-based optical sensors used for ground target identification. – (U) Developed advanced concepts for smart integrated sensor-processors to reduce data bandwidth requirements on space-based sensors. – (U) Developed advanced concepts for lightweight deployable large optics to permit long dwell optical surveillance from higher orbits. – (U) Developed the Atlas laser which produces the highest average power brightness ever reported at the 1.06 micron and 532 nanometer wavelengths. This diode-pumped, solid-state laser, with excellent beam quality, was installed at Kirtland’s Starfire Optical Range for active tracking experiments and for use as a Raleigh Beacon. 	
– (U) \$1,935	<p>Investigated and developed nonlinear optics (NLO) technologies to support imaging and other applications.</p> <ul style="list-style-type: none"> – (U) Continued to characterize automatic, all-optical techniques for producing pristine images from large, lightweight mirrors. – (U) Initiated an effort to produce a very efficient, mid-infrared source that uses a standard, near-infrared solid state laser and multiple nonlinear optical processes. – (U) Began studying NLO techniques for high bandwidth laser communications, automatic aimpoint maintenance, and lightweight optics for space applications. These techniques have the potential to increase communication data rates, reduce system size, weight and complexity, and improve system efficiency. – (U) Demonstrated an all-optical technique for correcting gross surface deformation errors in inflatable mirrors. – (U) Extended the operational modulation bandwidth of commercial diode laser by a factor of twenty. Performed a laboratory demonstration of an NLO technique for automatically acquiring and establishing an optical communication crosslink. These techniques have the potential to increase optical communication data rates, reduce system size, weight and complexity, and improve system efficiency. – (U) Demonstrated two sources of frequency-tunable, mid-infrared radiation based on NLO crystals pumped by standard, fixed-frequency, near-infrared, solid state lasers. Sources represented the most powerful, tunable sources in this spectral regime. The sources were transitioned to field tests. 	
– (U) \$1,980	<p>Investigated and developed advanced, high energy laser optical components.</p>	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 3326
<ul style="list-style-type: none"> – (U) Completed development of techniques to evaluate optical components installed in operational high energy laser systems for transition to advanced technology development. – Completed testing and accepted delivery of cooled, transmissive optical element which is environmentally safe, and relieves thermal overload in optical systems. – (U) Completed development of very low absorption, low-scatter optical, thin-film coatings. Transitioned technology to industry for scaling. This work will result in reduced cooling requirements, less optical distortion, decreased size and weight, and increased efficiency of optical systems used in airborne and space platforms. – (U) Designed and deposited optical coatings on three large optics (one 22-inch and two 36-inch) for use at the Starfire Optical Range. – (U) Identified a non-toxic, low-absorption coolant for use in a cooled transmissive optics operating at 1.315 microns. Also developed an optical contacting process for assembly of this type of optic. Active cooling of transmissive elements, such as beamsplitters, will reduce optical distortion due to laser heating. – (U) Designed, fabricated, and delivered a set of coating samples for incorporation into the Optical Properties Monitor (OPM) Experiment to determine the effect of the space environment on optical properties of coatings and materials. OPM is currently on Russia's Mir space station. – (U) \$3,552 Developed laser radar for space surveillance and remote sensing applications. – (U) Demonstrated capabilities to collect range, range rate, and doppler images against unaugmented low-earth orbit satellite. The technology provides improved range resolution and system operation without illumination from the sun. – (U) \$3,346 Developed high power semiconductor lasers/arrays at alternate wavelengths for applications and uses such as forward looking infrared (FLIR) systems and infrared (IR) missile warning sensor jamming, chemical agent detection, illuminators, efficient semiconductor laser array pumping modules and infrared countermeasures (IRCM). – (U) Demonstrated ten watts peak output power at two microns continuous wave operation from a semiconductor diode laser array module at room temperature. This demonstration provides a baseline for high efficiency pump laser arrays used as subcomponent in Band 4 optically-pumped semiconductor lasers, as well as a robust source for Band 1 IRCM. – (U) Demonstrated 100 milliwatts continuous laser output power at four microns from a single semiconductor diode. The data collected will be used to scale output power to levels required for next generation, high efficiency, compact Band 4 IRCM sources for small tactical aircraft self-protection -- a requirement which cannot be met by bulkier optically-pumped semiconductor lasers. – (U) \$16,771 Total 		
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$872 Develop generic, high energy laser technologies for applications such as illuminators and use in wavelength-specific military missions. 		
Project 3326	Page 20 of 38 Pages	Exhibit R-2 (PE 0602601F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 3326
<ul style="list-style-type: none"> – (U) \$2,678 – (U) Apply FY 1997 experimental results to technology demonstration of a high energy, chemical nitrogen chloride iodine transfer laser. This laser has the potential to be significantly lighter weight than a comparable chemical oxygen-iodine laser. – (U) \$1,460 Develop long-range optical imaging technologies for increased resolution and data fusion to support missions such as space object identification. <ul style="list-style-type: none"> – (U) Develop initial experiments on active and passive spectral technologies which increase performance and reduce cost of space-based optical sensors used for ground target identification. – (U) Evaluate on-board image processing concepts to decrease communication bandwidth requirements. – (U) Establish lab test facility for large deployable optics technology and smart sensors. – (U) \$4,659 Investigate and develop advanced laser radar for space surveillance and remote sensing using transceiver systems, and advanced data collection and processing algorithms for laser radar (LADAR) remote sensing of atmospheric properties, chemical agents, and target effluents, and intelligence preparation of the battlefield. <ul style="list-style-type: none"> – (U) Develop wavelength tunable laser heterodyne receiver technologies for advanced detection use. – (U) Develop models of advanced detection method performance based on heterodyne technologies. – (U) Investigate data analysis tools for real-time chemometric identification capability. – (U) \$1,652 Develop laser source and target coupling technology for next-generation high-payoff applications such as damage/destroy countermeasures against infrared imaging seekers. <ul style="list-style-type: none"> – (U) Begin investigating effects of laser illumination on materials relevant to degrade and damage infrared countermeasures (IRCM) applications. – (U) \$1,652 Investigate and develop nonlinear optics (NLO) technologies to support imaging and other applications. 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	
		PROJECT 3326
<ul style="list-style-type: none"> - (U) \$4,076 - (U) \$3,088 - (U) \$18,485 	<ul style="list-style-type: none"> - (U) Transition technology for automatic, all-optical compensation techniques for large lightweight mirrors with poor optical quality to imaging satellite systems development projects. Nonlinear optics are an improvement over currently used technologies by providing a more compact, lighter weight, faster, and less complex system for correcting figure errors. - (U) Demonstrate a tunable mid-infrared laser converter with better than 50% conversion efficiency from the near-infrared. This converter could potentially improve infrared countermeasures (IRCM) and sensing system efficiencies by a factor of two. - (U) Begin investigating NLO techniques to decrease system complexity and increase speed of aimpoint imaging and tracking for countermeasure applications. - (U) Continue to investigate NLO techniques to increase current laser communication bandwidths with automatic crosslink acquisition and tracking and lightweight optics. The use of NLO will provide a more lightweight, efficient communications system capable of handling more information. Develop high power semiconductor lasers/arrays at alternate wavelengths for applications and uses such as forward looking infrared (FLIR) systems and infrared (IR) missile warning sensor jamming, chemical agent detection, illuminators, efficient semiconductor laser array pumping modules, and disrupt/jam countermeasures against near-term threats. - (U) Demonstrate an incoherent 20 watt peak output power, continuous wave operation, two micron semiconductor diode laser array module at room temperature. This device will provide a compact, high power, efficient pump laser array used as a subcomponent in Band 4 optically-pumped semiconductor lasers to increase their performance. - (U) Demonstrate 750 milliwatts continuous laser output power at four microns wavelength from a single semiconductor diode. This demonstration will establish the feasibility of direct electrical-to-optical generation of mid-infrared wavelengths, enabling improved packing efficiency and reliability by a factor of two for small tactical aircraft self-protection. - (U) Demonstrate two watts coherent peak output power at quasi-continuous wave operation from a single, Band 1 semiconductor diode at room temperature. The collected data will demonstrate the necessary powers needed to jam Band 1 infrared surface-to-air missiles. Develop coherent laser diode arrays for improved performance/higher power in applications requiring high power levels. - (U) Demonstrate 100 watts continuous wave power from an array of phased diode lasers to establish the baseline technology for advanced laser defenses such as large aircraft self-protection. - (U) Demonstrate and evaluate a 200 watt high power system with a one cubic foot laser head. This one cubic foot design will provide the basis for high performance aircraft and space asset self-protection system designs. Total 	
<ul style="list-style-type: none"> (U) <u>FY 1999 (\$ in Thousands):</u> - (U) \$1,092 	<ul style="list-style-type: none"> Develop generic, high energy laser technologies for applications such as illuminators and use in wavelength-specific military missions. 	

		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research		PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development
– (U) \$3,837	<ul style="list-style-type: none"> – (U) Demonstrate a repetitively-pulsed, high average power, frequency-shifted chemical oxygen-iodine laser for use as a target illuminator. – (U) Develop scaling methodology for an all-electric, radio frequency-excited wave guide laser for aircraft application. <p>Develop long-range optical imaging technologies for increased resolution and data fusion to support missions such as space object identification and ground target identification from space.</p> <ul style="list-style-type: none"> – (U) Conduct initial experiments on 75 cm inflatable telescope mirror. This technology offers a dramatic reduction in weight for space-based optics. – (U) Conduct initial field experiments to evaluate the utility of space-based hyperspectral sensors for improved support for military operations. – (U) Evaluate on-board processing concepts to decrease satellite to earth communications requirements. This technology will deliver information much more quickly to the warfighter. – Develop remote optical sensing capabilities that demonstrate capabilities to identify and quantify battlefield gases in the atmosphere for both airborne and space applications. 	
–(U) \$1,502	<p>Investigate and develop advanced laser transceiver systems, and advanced data collection and processing algorithms for light detection and ranging (LIDAR) remote sensing of atmospheric properties, chemical agents, and target effluents, and intelligence preparation of the battlefield.</p> <ul style="list-style-type: none"> – (U) Develop and characterize wavelength tunable heterodyne receiver. Integrate into breadboard LIDAR system. – (U) Perform laboratory demonstration of heterodyne LIDAR (short-range field tests). – (U) Develop advanced detection analysis techniques using heterodyne methodology data. 	
– (U) \$2,977	<p>Develop laser source and target coupling technology for next-generation high-payoff applications such as damage/destroy countermeasures against infrared imaging seekers.</p> <ul style="list-style-type: none"> – (U) Begin development of improved surrogate threats for laboratory investigations. – (U) Begin development of advanced lasers and high accuracy pointer/tracker for potential use in infrared countermeasures (IRCM). – (U) Identify the laser characteristics required for an optimum damage and destroy device. 	
– (U) \$704	<p>Investigate and develop nonlinear optics (NLO) technologies to support imaging and other applications.</p>	

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	
		PROJECT 3326
<ul style="list-style-type: none"> - (U) \$4,849 	<ul style="list-style-type: none"> - (U) Continue improving performance of NLO devices to new regimes of operations: higher output powers; longer wavelengths; higher efficiencies. NLO techniques represent a powerful paradigm for leveraging off of technology investments in fixed-frequency laser sources for use in frequency conversion applications providing reduction in size, weight, power, and complexity while improving performance and efficiency. 	
<ul style="list-style-type: none"> - (U) \$4,415 	<ul style="list-style-type: none"> - Develop high power semiconductor lasers/arrays at alternate wavelengths for applications and uses such as forward looking infrared (FLIR) systems and infrared (IR) missile warning sensor jamming, chemical agent detection, illuminators, efficient semiconductor laser array pumping modules, and disrupt/jam countermeasures against near-term threats. - (U) Demonstrate 100 watts incoherent peak output power at quasi-continuous wave operation from a two micron semiconductor diode laser array module at room temperature. This demonstration will provide a baseline for high efficiency pump sources used as a subcomponent in portable, high brightness Band 4 optically-pumped semiconductor lasers for FY 2000 field experiments. - Demonstrate 0.5 watts average output power at greater than four microns from a semiconductor laser to establish the baseline for all laser-based small tactical aircraft self-protection capabilities. 	
<ul style="list-style-type: none"> - (U) \$19,376 	<ul style="list-style-type: none"> - Develop monolithic, coherent lasers for tactical/unmanned air vehicle and space applications such as designation/illumination and remote sensing which require higher power sources. - (U) Demonstrate fast electronic beam steering in a greater than 100 watt output power continuous wave array of phased diode lasers at 980 nanometers. - (U) Demonstrate a greater than 100 watt dual core fiber laser/array building blocks for use in multi-kilowatt laser systems. - Total 	

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 3326															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">18,553</td> <td style="text-align: center;">21,252</td> <td style="text-align: center;">20,716</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">16,771</td> <td style="text-align: center;">18,485</td> <td style="text-align: center;">19,376</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602101N, Directed Energy Weapons. - (U) PE 0602307A, Laser Weapon Technology. - (U) PE 0603314A, High Energy Laser and Directed Energy Components. - (U) PE 0603319F, Airborne Laser Demonstrator. - (U) PE 0603605F, Advanced Weapons Technology. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	18,553	21,252	20,716	Cont	(U) Current Budget Submit/FY 1999 PB	16,771	18,485	19,376	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>													
(U) Previous President's Budget (FY 1998 PB)	18,553	21,252	20,716	Cont													
(U) Current Budget Submit/FY 1999 PB	16,771	18,485	19,376	Cont													
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development				PROJECT 5797		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
5797 Advanced Weapons and Survivability Technology	14,072	14,468	14,645	15,834	16,159	16,779	17,188	Continuing	Continuing	
<p>(U) A. Mission Description and Budget Item Justification: High power microwave (HPM) and other unconventional weapon concepts using innovative technologies are explored in this project. Technologies that support a wide range of Air Force missions such as suppression of enemy air defenses, command and control warfare, and vehicle self-protection are developed. This project provides for vulnerability assessments of representative U.S. strategic and tactical systems to directed energy weapons, directed energy weapon technology assessment for specific Air Force missions, and directed energy weapon lethality assessments against foreign targets. In addition to directed energy weapon threats, this project conducts assessments of specific space environmental (natural and man-made) effects on space systems and develops hardening technologies and methodologies.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,536 Developed generic advanced weapon technologies that support many Air Force applications. <ul style="list-style-type: none"> - (U) Continued to develop advanced pulse-power, microwave, and radio-frequency technologies for offensive and defensive weapon systems. - (U) Improved high-performance computer codes to support narrowband HPM source and pulsed power research. - (U) Began development of first-generation, compact, high-voltage pulsed electrical power generator for microwave and radio frequency sources. - (U) Began assessment of the ability of pulsed power and HPM technology to neutralize biological weapons. - (U) Continued to develop narrowband and wideband sources and antennas. 										
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 5797
<ul style="list-style-type: none"> - (U) \$2,414 - (U) \$3,265 - (U) \$2,182 	<ul style="list-style-type: none"> Assessed effects/lethality of directed energy weapon technologies against representative air and ground military systems. <ul style="list-style-type: none"> - (U) Progress made in developing computer modeling codes that model high power microwave (HPM) coupling into cockpit areas of advanced technology aircraft. Small-aircraft simulator was used to make wide variety of direct-injection HPM experiments which yielded data on HPM effects on subsystems. - (U) Proposed protection technology presented to F-16 system program office (SPO) for their consideration; assessment of aircraft susceptibilities to wide-band HPM continued. - (U) Numerical analyses and associated experimental measurements were made on a large group of command and control warfare hardware assets. - (U) Large group of space-related electronics and command and control warfare electronics were investigated for type and threshold of effects caused by different HPM threats. - (U) Extensive HPM coupling measurements were performed on C-130 aircraft. Criteria for protection for mission-essential electronics were developed. Developed HPM technologies that will support applications such as suppression of enemy air defenses, command and control warfare, and aircraft self-protection. <ul style="list-style-type: none"> - (U) Extensive experimental measurements conducted on key elements of a command and control installation. - (U) Solid state source technology was selected for aircraft self protection application. Two large experimental efforts provided valuable information on source waveform requirements. - (U) Refined computer models of weapon effectiveness for all weapon applications. - (U) The down-selected narrow-band source for suppression of enemy air defenses demonstrated capability to defeat older (harder) technology mobile command and control center. Developed HPM technologies, including susceptibility and effects experiments and modeling and data base development, to support space control applications. <ul style="list-style-type: none"> - (U) Executed susceptibility experiments and analysis of effects on two subsystems and two devices. - (U) Selected and evaluated technologies that lead to selection of best concepts for basing of HPM technology. - (U) Developed requirements for source technology development in support of threat demonstration. - (U) Began to develop experimental methodologies to measure effects of HPM on satellite systems. 	
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 5797
<ul style="list-style-type: none"> - (U) \$1,675 	<ul style="list-style-type: none"> Assessed the vulnerability of various space assets to threats such as solar radiation and directed energy weapons. <ul style="list-style-type: none"> - (U) Improved directed energy weapon lethality and assessment models for five satellites. - (U) Continued satellite survivability/vulnerability/lethality assessments for ground-based laser technology. - (U) Transitioned advanced data fusion techniques to the multi-spectral, multi-sensor data analysis workstation. 	
<ul style="list-style-type: none"> - (U) \$14,072 	<ul style="list-style-type: none"> Total 	
(U) <u>FY 1998 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$5,688 	<ul style="list-style-type: none"> Develop generic advanced weapon technologies that support many Air Force applications. <ul style="list-style-type: none"> - (U) Apply high performance, parallel, plasma physics computer codes to narrowband source and compact pulsed power design. - (U) Perform integrated experiments to assess coupling compact, high voltage electrical generators; gigawatt narrowband devices; and efficient antennas. - (U) Complete development of high power, first generation wideband source, including antenna. - (U) Complete the assessment of the ability of pulsed power and high power microwave (HPM) technology to neutralize biological weapons. 	
<ul style="list-style-type: none"> - (U) \$1,864 	<ul style="list-style-type: none"> Assess effects/lethality of directed energy weapon technologies against representative air and ground military systems. <ul style="list-style-type: none"> - (U) Continue to identify HPM protection requirements for large aircraft (cargo-transport and bombers) carrying future HPM devices. - (U) Continue to develop practical methods to protect existing and advanced technology aircraft from proposed/identified external HPM threats. - (U) Continue to develop techniques and technology to evaluate HPM coupling and effects into hardened, command-post like structures with modern electronics. - (U) Continue to develop and validate techniques to evaluate HPM effects on families of electronics components found in difficult-to-obtain weapons/threats. - (U) Continue to develop and validate advanced computer models which provide predictions for HPM coupling and effects into a wide variety of structures (command posts) and weapons systems of moderate complexity. 	
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	
PROJECT 5797		
<ul style="list-style-type: none"> - (U) \$3,154 - (U) \$1,890 - (U) \$1,872 - (U) \$14,468 	<ul style="list-style-type: none"> Develop high power microwave (HPM) technologies that will support applications such as suppression of enemy air defenses, command and control warfare, and aircraft self-protection. <ul style="list-style-type: none"> - (U) Use new technology ultra-wideband (UWB) sources to perform effects experiments on structures with command and control electronics systems. - (U) Prepare and implement diagnostic procedures and instrumentation for a critical experiment to demonstrate UWB capability to defeat infrared seekers. - (U) Improve transition of computer modeling code and experimental data into operational (flyout) modeling codes to model HPM effects on postulated missile threats. - (U) Integrate previously down-selected narrow-band source with newly developed pulsed-power generator for suppression of enemy air defenses. Develop high power microwave (HPM) technologies, including susceptibility and effects experiments and modeling and data base development, to support space control applications. <ul style="list-style-type: none"> - (U) Transition effects analysis and experimentation from subsystem to systems, begin to demonstrate and quantify effects on systems. - (U) Thoroughly evaluate best basing mode for HPM technology demonstration. - (U) Begin source development to support threat demonstration. Assess the vulnerability of various space assets to threats such as solar radiation and directed energy weapons. <ul style="list-style-type: none"> - (U) Continue to develop directed energy weapon lethality and assessment models for five satellites. - (U) Continue satellite survivability/vulnerability/lethality assessments for ground-based laser technology. - (U) Continue to transition advanced data fusion techniques to the multi-spectral, multi-sensor data analysis workstation. Total 	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$6,074 	<ul style="list-style-type: none"> Develop generic advanced weapon technologies that support many Air Force applications. <ul style="list-style-type: none"> - (U) Develop and test components for next-generation, compact, high voltage, high impedance, pulsed electrical power sources for microwave and radio frequency sources. - (U) Complete the transition of high performance plasma physics computer simulation codes to designers of microwave and pulsed power devices. - (U) Develop technology to increase the energy efficiency of multiwatt narrowband sources. - (U) Develop technologies for next-generation wideband sources and antennas. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602601F Phillips Laboratory Exploratory Development	5797
<ul style="list-style-type: none"> - (U) \$2,046 Assess effects/lethality of directed energy weapon technologies against representative air and ground military systems. <ul style="list-style-type: none"> - (U) Finalize development of computer modeling codes that predict high power microwave (HPM) coupling into advanced technology aircraft. - (U) Begin transitioning specifications and standards and HPM hardness technologies to fighter aircraft. - (U) Continue directed energy weapon lethality/survivability enhancements and characterization of equipment upset of various foreign and U.S. systems for advanced tactical applications. - (U) Transfer HPM protection technology for large aircraft, such as cargo-transport, air-refueling, and bomber aircraft. - (U) Continue effects experiments on networks typical of command and control facilities. - (U) \$3,425 Develop HPM technologies that will support applications such as suppression of enemy air defenses, command and control warfare, and aircraft self-protection. <ul style="list-style-type: none"> - (U) Finalize in situ experimentation with installed systems for command and control warfare using HPM. - (U) Continue in situ demonstrations of selected HPM sources that could be used for aircraft self-protection and other advanced tactical applications. - (U) Continue to improve and validate computer models of weapon effectiveness for all weapon applications. - (U) Demonstrate technology applicability for advanced tactical applications with an experiment using a downselected source. - (U) \$1,286 Develop HPM technologies, including susceptibility and effects experiments and modeling and data base development, to support space control applications. <ul style="list-style-type: none"> - (U) Continue source technology development to support threat demonstration. - (U) Continue susceptibility experiments on subsystems to support threat demonstration. - (U) \$1,814 Assess the vulnerability of various space assets to threats such as solar radiation, space debris, and directed energy weapons. <ul style="list-style-type: none"> - (U) Select directed energy weapon lethality and assessment models for five satellites. - (U) Continue survivability/vulnerability/lethality assessments for ground-based laser technology. - (U) Continue to transition advanced data fusion techniques to the multi-spectral, multi-sensor data analysis workstation. - (U) \$14,645 Total 		
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BUDGET ACTIVITY 2 - Applied Research			PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development					PROJECT 8809			
COST (\$ In Thousands)			FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
8809 Space and Missile Technology			49,667	35,585	31,119	41,678	47,182	50,241	51,305	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project focuses on five major space and missile technology areas: spacecraft platform technologies (e.g., structures, controls, power, and thermal management); space-based payload technologies (e.g., sensors, satellite communications, and survivable electronics); satellite control technologies (e.g., spacecraft software); ballistic missile/launch vehicle specific technologies (e.g., astrodynamics and guidance, navigation, and control avionics); and integrated experiments of advanced technologies for transition to planned systems (e.g., payload/platform/launch vehicle merging).</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5,206 Developed technologies for space platform subsystems such as cryocoolers, space vehicle thermal management, compact solar power cells, lightweight batteries, and innovative power generation concepts. <ul style="list-style-type: none"> - (U) Completed solar cell flexible array technology trade studies. - (U) Initiated development program for ultra-high efficiency four-junction photovoltaic and thermal electric cells. - (U) Continued development of solid state primary battery for space and missile launch vehicle applications. - (U) Began development of lightweight flywheel integrated power and attitude control systems (IPACS); goal is seven-fold decrease in subsystem weight. - (U) Initiated cryocooler component reliability characterization study. - (U) Designed, fabricated, and flight-qualified capillary pumped loop/looped heat pipe thermal management systems for distributed and load sharing applications. - (U) \$4,916 Developed technologies for space platform structures such as spacecraft structural controls for vibration suppression and lightweight composite satellite and launch vehicle structures. <ul style="list-style-type: none"> - (U) Continued research efforts in adaptive structures technology emphasizing Adaptive Neural Control (ANC). - (U) Fabricated, tested, and integrated an advanced isolation system into the Space Test Research Vehicle 2 (STRV2) spacecraft to stabilize an electro-optic camera. - (U) Continued joint program to develop advanced mechanisms which will improve the design of solar array subsystems. - (U) Fabricated, tested, and flight demonstrated advanced lightweight launch vehicle structures. - (U) Continued the development of multifunctional spacecraft structures. - (U) Initiated space-based radar structures program. 											
Project 8809			Page 32 of 38 Pages				Exhibit R-2 (PE 0602601F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	
	PROJECT 8809	
– (U) \$4,556	Developed technologies for space-based payload subsystems such as hardened sensors and satellite communications. <ul style="list-style-type: none"> – (U) Continued improvement of long-wavelength mercury cadmium telluride detectors and optimized design for large focal plane arrays. – (U) Continued development of larger format, quantum well, infrared photodetector focal plane arrays. – (U) Evaluated and characterized radio frequency communications modem, modem controllers and network components. – (U) Integrated space-based surveillance antenna component technologies to support system level design concepts. 	
– (U) \$3,411	Developed technologies for space-based payload components such as hardened electronics and memories. <ul style="list-style-type: none"> – (U) Evaluated and fabricated advanced packaging technology whose goal is a ten times size/volume/weight reduction. – (U) Initiated evaluation of a standard space-based surveillance signal processing module. 	
– (U) \$3,263	Developed technologies for satellite control, astrodynamics, modeling and simulation, and autonomous operations. <ul style="list-style-type: none"> – (U) Developed satellite control software for applications such as multi-mission advanced ground intelligent control. – (U) Developed next generation astrodynamics models for orbit determination and collision risk assessment. – (U) Developed simulation architecture for space-based surveillance models. – (U) Evaluated software for autonomous space technology product development. 	
– (U) \$16,904	Developed ground and small satellite integration technologies for space and near-space experiments. <ul style="list-style-type: none"> – (U) Completed MightySat I spacecraft and experiments assembly. Integrated experiments with spacecraft. Technologies to be evaluated include: increased power solar cells; lightweight composite structures; shape memory release device; microparticle impact detector; and electronics miniaturization techniques. Performed environmental test and checkout. Integrated MightySat I on Shuttle Hitchhiker Ejection System for launch on shuttle flight Shuttle Transportation System 88 (STS-88). – (U) Assembled and integrated exploratory, hardware-in-the-loop satellite technologies to validate overall sparse optical array concept through the UltraLITE ground demonstration, a large high precision space mirror. – (U) Designed the baseline MightySat Phase II vehicle. Tailored vehicle basic design to meet requirements of first flight which will demonstrate nine distinct experiments. These include a Fourier transform hyperspectral imager, pulsed plasma thrusters, multi-functional structures, miniaturized electronics, and a solar array concentrator. – (U) Developed near-space capabilities for experiments requiring high altitudes and guided recovery systems. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	
PROJECT 8809		
<ul style="list-style-type: none"> - (U) \$1,908 - (U) \$9,503 - (U) \$49,667 	<ul style="list-style-type: none"> Developed technologies such as guidance, navigation, and control avionics to support launch vehicles and ballistic missile flights. <ul style="list-style-type: none"> - (U) Began fabrication of solid state micro-mechanical guidance instruments for future ballistic missile environments. - (U) Evaluated a next generation thrust axis accelerometer. - (U) Continued development of improved techniques to determine accurate gravity field values--major source of error in space inertial navigation systems. Began development of a Rocket System Launch Program launch capability using excess ballistic missile assets to test low-cost pop-up upperstage systems. Total 	
(U) <u>FY 1998 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$4,723 - (U) \$4,017 	<ul style="list-style-type: none"> Develop technologies for space platform subsystems such as cryocoolers, space vehicle thermal management, compact solar power cells, lightweight batteries, and innovative power generation concepts. <ul style="list-style-type: none"> - (U) Continue development of ultra-high efficiency four-junction photovoltaic and thermal electric cells. - (U) Conduct in-house electrical characterization of Manufacturing Technology (ManTech) 24% efficient three-junction solar cell. - (U) Establish interagency cooperative development of lithium ion battery technology for space vehicle applications. - (U) Continue development of lightweight flywheel integrated power and attitude control systems (IPACS); goal is seven-fold decrease in subsystem weight. - (U) Continue cryocooler reliability improvement initiatives and begin development of improved cryocooler models and simulation software. - (U) Continue development of enhanced capillary pumped loop/looped heat pipe thermal management systems and design cryogenic capillary pumped loop/looped heat pipe system for cryogenic sensor integration. Develop technologies for space platform structures such as spacecraft structural controls for vibration suppression and lightweight composite satellite and launch vehicle structures. <ul style="list-style-type: none"> - (U) Continue the advanced adaptive structures technology development program. - (U) Continue launch vibration isolation program. - (U) Initiate miniature isolation system program. - (U) Continue development of multifunctional spacecraft structures. - (U) Continue space-based radar structures program. - (U) Continue development of lightweight launch vehicle structure technologies. 	
Project 8809	Page 34 of 38 Pages	Exhibit R-2 (PE 0602601F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602601F Phillips Laboratory Exploratory Development	8809
<ul style="list-style-type: none"> - (U) \$2,186 Develop technologies for space-based payload subsystems such as hardened sensors and satellite communications. <ul style="list-style-type: none"> - (U) Investigate suitability of long wavelength quantum well infrared photodetector technology for space-based surveillance systems. - (U) Begin analysis and development of alternative technologies (e.g., antenna design) for low altitude space-based radar systems. - (U) \$3,862 Develop technologies for space-based payload components such as hardened electronics and memories. <ul style="list-style-type: none"> - (U) Continue evaluation and fabrication of advanced packaging technology whose goal is a 90% reduction in size/volume/weight. - (U) Identify methods and techniques for exploiting commercial electronic advancements to develop low-power, high-performance, radiation-hardened devices and circuits for DoD space programs - (U) Evaluate suitability of micro-electro-mechanical technologies for use in space-based systems. - (U) \$2,601 Develop technologies for satellite control, astrodynamics, modeling and simulation, and autonomous operations. <ul style="list-style-type: none"> - (U) Complete development of satellite control software for applications such as multi-mission advanced ground intelligent control. - (U) Continue development of next generation astrodynamics models for orbit determination and collision risk assessment. - (U) Continue development of simulation architecture for space-based surveillance models for wargaming, training, and concept of operations (CONOPs). - (U) Determine requirements for software for distributed networks for battlespace observation, and data collection, processing, and dissemination. - (U) Begin development of software for autonomous space technology products. - (U) \$11,103 Develop ground and small satellite integration technologies for space and near-space experiments. <ul style="list-style-type: none"> - (U) Launch MightySat I from Space Shuttle mission STS-88. Conduct flight operations. One year on-orbit will validate space applied research technologies minimizing the risk of inserting advanced technology into operational satellites. - (U) Continue fabrication of MightySat II.1 spacecraft bus and begin integration of experiments for FY 2000 launch. - (U) Begin integration of technologies manifested for MightySat II.2 which tentatively include autonomous navigation and control, autonomous decision-making, threat-warning component technologies, a flywheel energy storage device, and space-based space surveillance - (U) Demonstrate the capability to dynamically control the position of a large aperture, sparse optical array via a fully integrated UltraLITE ground demonstration. - (U) Continue the development of near-space capabilities and bus technologies for experiments requiring high altitudes and guided recovery systems. 		
Project 8809	Page 35 of 38 Pages	Exhibit R-2 (PE 0602601F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602601F Phillips Laboratory Exploratory Development	8809
<ul style="list-style-type: none"> - (U) \$1,289 Develop technologies such as guidance, navigation, and control avionics to support launch vehicles and ballistic missile flights. <ul style="list-style-type: none"> - (U) Complete improved techniques to determine accurate gravity field values, a major source of error in space inertial navigation systems. - (U) \$5,804 Conduct Phase III of the Terabit fiber optic technology program. - (U) \$35,585 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5,040 Develop technologies for space platform subsystems such as cryocoolers, space vehicle thermal management, compact solar power cells, lightweight batteries, and innovative power generation concepts. <ul style="list-style-type: none"> - (U) Continue development of ultra-high efficiency four-junction photovoltaic and thermal electric cells. - (U) Conduct in-house electrical characterization of 35-40% efficient four-junction solar cells. - (U) Continue interagency cooperative development of lithium ion battery technology; integrate deliverable into flight experiment. - (U) Initiate new integrated power chip program for microsattellites. - (U) Begin development of electrochromic thermal coatings for advanced deployable thermal radiators. - (U) Continue development and enhance cryocooler models and simulation software. - (U) Continue development of enhanced capillary pumped loop/looped heat pipe thermal management systems for space vehicles. - (U) \$5,137 Develop technologies for space platform structures such as spacecraft structural controls for vibration suppression and lightweight composite satellite and launch vehicle structures. <ul style="list-style-type: none"> - (U) Complete the advanced adaptive structures technology development program. - (U) Continue launch vibration isolation program. - (U) Continue design efforts for the miniature isolation system program. - (U) Initiate the autonomous active structural control program. - (U) Initiate advanced gimbal program. - (U) Continue development of multifunctional spacecraft structures. - (U) Continue space-based radar structures program. - (U) Continue development of lightweight launch vehicle structure technologies. - (U) \$2,041 Develop technologies for space-based payload subsystems such as hardened sensors and satellite communications. <ul style="list-style-type: none"> - (U) Begin development of advanced infrared photodetectors (e.g., multi-spectral quantum wells) for space applications. - (U) Continue analysis and development of alternative technologies (e.g., antenna design) for low altitude space-based radar systems. 		
Project 8809	Page 36 of 38 Pages	Exhibit R-3 (PE 0602601F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 8809
– (U) \$3,955	Develop technologies for space-based payload components such as hardened electronics and memories.	
	– (U) Continue evaluation and fabrication of advanced packaging technology whose goal is 90% reduction in size/volume/weight.	
	– (U) Continue to identify methods and techniques for exploiting commercial electronic advancements to develop low-power, high-performance, radiation-hardened devices and circuits for DoD space programs.	
	– (U) Begin development of guidance and navigation components based on micro-electro-mechanical system (MEMS) technologies.	
– (U) \$3,273	Develop technologies for satellite control, astrodynamics, modeling and simulation, and autonomous operations.	
	– (U) Continue development of next generation astrodynamics models for orbit determination and collision risk assessment.	
	– (U) Continue development of simulation architecture for space-based surveillance models for wargaming, training, and concept of operations (CONOPs).	
	– (U) Design architecture and start development of software for distributed networks for battlespace observation, and data collection, processing, and dissemination.	
	– (U) Continue development of software for autonomous space technology products.	
– (U) \$11,673	Develop ground and small satellite integration technologies for space and near-space experiments.	
	– (U) Conclude MightySat I flight operations. Develop and distribute final report.	
	– (U) Complete fabrication of MightySat II.1. Complete payload integration and launch vehicle integration of MightySat II.1 to launch aboard Orbital-Suborbital Program launch vehicle in FY 2000.	
	– (U) Begin initial design of modifications to baseline MightySat II vehicle to accommodate experiments on autonomous navigation and control, autonomous decision-making, threat-warning component technologies, a flywheel energy storage device, and space-based space surveillance.	
	– (U) Develop microsatellite technologies in support of near-earth object inspection and asteroid fly-by mission.	
	– (U) Begin integration of the second integrated ground, hardware-in-the-loop demonstration which will demonstrate integrated spacecraft energy storage and attitude control.	
	– (U) Continue the development of near-space capabilities and bus technologies for experiments requiring high altitudes and guided recovery systems.	
– (U) \$31,119	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602601F Phillips Laboratory Exploratory Development	PROJECT 8809																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">53,513</td> <td style="text-align: center;">28,469</td> <td style="text-align: center;">31,263</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">49,667</td> <td style="text-align: center;">35,585</td> <td style="text-align: center;">31,119</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602203F, Aerospace Propulsion. - (U) PE 0602102F, Materials. - (U) PE 0603302F, Space and Missile Rocket Propulsion. - (U) PE 0603311F, Ballistic Missile Technology. - (U) PE 0603401F, Advanced Spacecraft Technology. - (U) PE 0603410F, Space Systems Environmental Interactions. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	53,513	28,469	31,263	Cont	(U) Current Budget Submit/FY 1999 PB	49,667	35,585	31,119	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	53,513	28,469	31,263	Cont														
(U) Current Budget Submit/FY 1999 PB	49,667	35,585	31,119	Cont														
Project 8809	Page 38 of 38 Pages	Exhibit R-2 (PE 0602601F)																

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	39,222	38,505	41,529	42,826	45,556	46,243	47,536	Continuing	Continuing
2068 Advanced Guidance Technology	13,502	14,095	16,925	16,188	17,202	17,399	17,829	Continuing	Continuing
2502 Ordnance Technology	25,720	24,410	24,604	26,638	28,354	28,844	29,707	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0		0	0	0	0

Note: Beginning in FY 1998, Project 2543 has been combined with Project 2502. The total PE costs shown for FY 1997 reflect this consolidation.

(U) A. Mission Description and Budget Item Justification: This Applied Research program develops and establishes the feasibility of advanced technologies for conventional weapons. The program includes development of: (1) advanced guidance component technology for low-cost precision adverse-weather autonomous seekers; (2) advanced navigation/control technologies for advanced munitions; (3) fuze technology to reduce cost and increase supportability, safety, and performance; (4) affordable explosives for higher performance and lower sensitivity; (5) advanced analytical tools for calculating weapons effects to reduce development time and cost; (6) advanced weapon airframe (including highly agile control technology) and carriage technology; (7) advanced warhead development technologies and advanced kill mechanisms for target defeat; and (8) advanced analytical methods for predicting advanced weapons effectiveness.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	41,038	40,772	42,999	Cont
(U) Appropriated Value	42,573	40,772		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-952	-1,780		
b. SBIR	-509	-487		
c. Omnibus/Other Above Threshold Reprogrammings	-1,845			
d. Below Threshold Reprogrammings				
e. Rescissions	-45			
(U) Adjustments to Budget Year Since FY 1998 PB			-1,470	
(U) Current Budget Submit/FY 1999 PB	39,222	38,505	41,529	Cont

(U) Change Summary Explanation:

Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary: Not Applicable.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602602F Conventional Munitions				PROJECT 2068		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2068	Advanced Guidance Technology	13,502	14,095	16,925	16,188	17,202	17,399	17,829	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops precision terminal guidance technologies for air-launched conventional weapons and technologies for midcourse guidance for advanced munitions. Project payoffs include: adverse-weather and "launch and leave" precision guidance capability; increased number of kills per sortie; increased aircraft survivability; improved reliability and affordability; reduced test costs; shorter development programs; and improved survivability and effectiveness of conventional weapons.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,926 Develop and demonstrate guidance component technology for low-cost, precision, adverse-weather capable, autonomous seekers. <ul style="list-style-type: none"> - (U) Completed correlation filter development for laser radar (LADAR) sensors; continued development of optical correlator technologies (i.e., high-speed, high resolution, multiple state-capable correlator hardware). - (U) Continued experiments on an adverse-weather, wide field-of-view, high resolution, passive, millimeter wave sensor for use in future covert seekers. - (U) Completed design and initiated fabrication/integration of a conformal antenna array breadboard seeker that provides an instantaneously accessible wide field-of-regard. - (U) Completed construction of a multichannel LADAR breadboard; utilized completed breadboard to continue technology base development to enhance the capability of solid state LADAR (e.g., increase operating range, assess rapid scanning techniques, develop multichannel receiver capability, and develop longer wavelength technology). - (U) Assessed promising target/background signature phenomenology to exploit for an advanced infrared (IR) imaging seeker. - (U) Completed construction of breadboard scene projector for solid state LADAR seekers. - (U) Investigated sensor modeling techniques for an autonomous LADAR guidance system. - (U) Developed LADAR algorithms for detecting, recognizing, and guiding seekers to high value targets in clutter and countermeasure environments. - (U) \$4,032 Develop and demonstrate advanced navigation/control technologies for advanced munitions. <ul style="list-style-type: none"> - (U) Completed breadboard assembly and laboratory testing; developed preliminary design for an advanced jam resistant Global Position System/Inertial Navigational System that is 40 percent of the size and cost of FY 1995 technology. - (U) Completed fabrication of micro-machined inertial sensor and begin fabrication of a breadboard inertial measurement unit. 										
Project 2068		Page 3 of 14 Pages				Exhibit R-2 (PE 0602602F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 2068
– (U) \$1,544	Develop and demonstrate instrumentation for weapons guidance development and evaluation.	
	– (U) Completed development of new subminiature telemetry chip-set functions and new packaging concepts for high-g usage.	
	– (U) Completed development of spectrally efficient modulation and coding methods for telemetering wideband test data.	
– (U) \$13,502	Total	
(U) FY 1998 (\$ in Thousands):		
– (U) \$8,821	Develop and demonstrate guidance component technology for low-cost, precision, adverse-weather capable, autonomous seekers.	
	– (U) Continue development of optical correlator technologies (i.e., high-speed, high resolution, multiple state-capable correlator hardware); provide filters to support optical processing enhanced laser radar experiments.	
	– (U) Conduct phenomenology analysis of high resolution, passive, millimeter wave target background imagery for use in future adverse weather wide field of view covert seekers.	
	– (U) Complete fabrication/integration of a conformal array seeker breadboard that provides an instantaneously accessible, wide field-of-regard.	
	– (U) Investigate laser radar (LADAR) techniques for penetrating adverse-weather; build and test a two-wavelength LADAR system; design/build a flightworthy LADAR modular brassboard seeker; and design a snapshot LADAR system.	
	– (U) Evaluate current technologies for developing affordable, passive, electro-optical/infrared seekers sensitive to infrared, multi-color, and polarization phenomena that will provide improved autonomous terminal seekers.	
	– (U) Develop sensor models for LADAR and passive millimeter wave (MMW) to assess target model fidelity impact.	
	– (U) Validate LADAR algorithms for detecting, recognizing and guiding on high value targets in a clutter and countermeasure environment.	
	– (U) Complete validation of a four-channel pixel-registered active/passive infrared (IR)/MMW synthetic scene generation code against range measured data.	
– (U) \$4,653	Develop and demonstrate advanced guidance technologies for advanced munitions.	
	– (U) Complete breadboard Antijam Global Positioning System/Inertial Navigation System (GPS/INS) fabrication and test; initiate design for a brassboard advanced Antijam GPS/INS that is 40 percent of the size and cost of FY 1995 technology.	
	– (U) Complete development, fabrication, and testing of the breadboard inertial measurement unit (IMU) system; initiate the design of the IMU system brassboard based on the breadboard IMU test results.	
– (U) \$621	Develop and demonstrate advanced control technologies for advanced munitions.	
	– (U) Develop weapons hardware-in-loop simulation software; initiate flight software development and test missile six Degree-Of-Freedom (DOF) simulation.	
– (U) \$14,095	Total	

		DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research
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PE NUMBER AND TITLE 0602602F Conventional Munitions

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 2068
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$9,718	Develop and demonstrate guidance component technology for low-cost, precision, adverse-weather capable, autonomous seekers.	
	– (U) Complete optical filter development for the optical processing enhanced laser radar (LADAR) experiments; develop processing hardware technology for advanced sensors; and, develop accompanying advanced filter concepts to include ultra high-speed processors for miniature electro-optical and radio frequency imaging sensors.	
	– (U) Initiate design for fabrication and assembly of a passive millimeter wave (MMW) for a captive flight test imaging sensor.	
	– (U) Ground test a conformal antenna seeker breadboard that provides an instantaneously addressable wide field-of-regard.	
	– (U) Develop specifications for affordable, passive, electro-optical/infrared seekers sensitive to multi-color infrared and polarization phenomena to provide improved autonomous terminal seekers; determine applicability of advanced imaging infrared (IR) versus LADAR for endgame aimpoint selection and guidance integrated fuzing.	
	– (U) Utilize captive flight brassboard LADAR system for image collection and detecting occluded targets; test two-wavelength LADAR concept for detecting occluded targets; develop and fabricate a 1.06 micron snapshot LADAR system; assess frequency agile laser sources.	
	– (U) Develop a LADAR autonomous algorithm suite to identify mobile targets having articulated components.	
	– (U) Enhance baseline Modular Algorithm Concept Evaluation Tool (MACET) to include tracking/aimpoint selection algorithms, on-line help functions, improved signal/image processing functions and data fusion algorithms.	
	– (U) Initiate the design and development of an active/passive infrared air-to-air target/scene modeling capability to facilitate the design and testing of autonomous target acquisition algorithms.	
– (U) \$3,574	Develop and demonstrate advanced guidance technologies for advanced munitions.	
	– (U) Complete brassboard Antijam Global Positioning System/Inertial Navigation System (GPS/INS) design and begin fabrication of a brassboard GPS/INS that is highly jam resistant, affordable, and readily useable in future tactical weapons.	
	– (U) Complete development, fabrication, and testing of the inertial measurement unit system brassboard.	
– (U) \$3,633	Develop and demonstrate advanced control technologies for advanced munitions.	
	– (U) Complete development of a six Degree-Of-Freedom (DOF) simulation; that incorporates high fidelity wind tunnel and control system data; evaluate autopilot and guidance system performance with hardware-in-the-loop tests.	
– (U) \$16,925	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 2068															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">14,385</td> <td style="text-align: center;">15,025</td> <td style="text-align: center;">17,265</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">13,502</td> <td style="text-align: center;">14,095</td> <td style="text-align: center;">16,925</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0603601F, Conventional Weapons Technology. - (U) PE 0604314F, Advanced Medium Range Air-to-Air Missile. - (U) PE 0604940D, Central Test and Evaluation Improvement Program. - (U) PE 0604604F, Submunitions Development. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	14,385	15,025	17,265	Cont	(U) Current Budget Submit/FY 1999 PB	13,502	14,095	16,925	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>													
(U) Previous President's Budget (FY 1998 PB)	14,385	15,025	17,265	Cont													
(U) Current Budget Submit/FY 1999 PB	13,502	14,095	16,925	Cont													
Project 2068	Page 6 of 14 Pages	Exhibit R-2 (PE 0602602F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 2502
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2502 Ordnance Technology	25,720	24,410	24,604	26,638	28,354	28,844	29,707	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops technologies for advanced weapon dispensers, submunitions, safe and arm devices, fuzes, explosives, and warheads for conventional weapons, and weapon airframe and carriage technology. The payoffs include: improved storage capability and transportation safety of fully assembled weapons; improved non-nuclear warhead and fuze effectiveness; improved submunition dispensing; selectable multimode kill capability; low-cost airframe/subsystem components and structures; and reduced aircraft/weapons drag and radar signature. Assesses the lethality and effectiveness of current and planned conventional weapons technology programs, and assesses the vulnerability of targets against which conventional weapons are designed. Project payoffs include more thoroughly tested weapon systems and improved weapon lethality.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,737 Develop and demonstrate fuze technology to reduce cost and increase supportability, safety, and performance.
 - (U) Fabricated and evaluated a proximity sensor for general purpose bomb fuzes; investigated implementations of high/low drag sensing methods.
 - (U) Conducted preliminary design studies of a hard target penetrating radar fuze to optimize burst point selection.
 - (U) Completed trade studies on an integrated ordnance package capable of defeating future air targets and surface-to-air missiles.
- (U) \$2,083 Develop and demonstrate affordable explosives for higher performance and lower sensitivity.
 - (U) Conducted initial explosive experiments to provide low-cost technologies for demilitarization of weapon explosives.
 - (U) Continued sensitivity experiments of insensitive explosive fills which survive hard target penetration while increasing blast performance.
- (U) \$1,323 Develop and demonstrate advanced analytical tools for calculating weapons effects to reduce development time and cost.
 - (U) Validated explosive shock wave interaction simulation for developing advanced multimode warheads.
 - (U) Defined methodology for incorporation of unstructured grid methods into penetrator weapon design tools.
 - (U) Planned development of next generation weapon design methods for hard target warheads incorporating heavy metals.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 2502
<ul style="list-style-type: none"> - (U) \$4,515 Develop and demonstrate advanced weapon airframe and carriage technology for advanced munitions. <ul style="list-style-type: none"> - (U) Developed flight control software and simulations for a highly maneuverable weapon incorporating hybrid reaction jet/aerodynamic flight controls. - (U) Continued development of initial system integration/design of a rapid response weapon for effectively engaging time-critical targets. - (U) Completed fabrication of selected fin folding and deployment mechanisms for compressed carriage. - (U) Continued installation of high resolution solid state, digital shadow-graph system to allow for quick and less expensive data collection, processing, and analysis to reduce time to evaluate projectile configurations. - (U) \$6,753 Develop and demonstrate advanced warhead development technologies and advanced kill mechanisms for target defeat. <ul style="list-style-type: none"> - (U) Completed experiments for coupling electrical energy into targets using antimateriel warhead. - (U) Performed subscale tests of advanced penetrator warhead materials for high velocity penetration. - (U) \$3,026 Develop and demonstrate munitions data acquisition technology. <ul style="list-style-type: none"> - (U) Completed weapons effects holography program; transition technology to munition development facilities. - (U) Fabricated and tested brassboard automated holographic data reduction system to provide improved warhead hydrocode test data. - (U) Integrated and laboratory tested high-speed, high resolution electronic imager. - (U) \$2,163 Develop and extend Modular Effectiveness Vulnerability Assessment (MEVA) code to increase accuracy of weapon effectiveness predictions against fixed hardened targets. <ul style="list-style-type: none"> - (U) Continued MEVA code configuration management activities to ensure software changes are authorized, validated, documented, and distributed to user community; weapons combined effects software module completed. - (U) Continued component vulnerability experiments, developed first set of fragility algorithms for integration in MEVA code, and completed code validation experiments. - (U) Developed algorithms and new functional modules for integration into MEVA to accurately predict the effectiveness of advanced munitions technology concepts. - (U) Completed development/integration of systems level lethality/vulnerability assessment methodologies into MEVA for buried/hardened targets, above ground structures, tunnels, linear targets, and weapons of mass destruction. - (U) \$1,683 Develop and demonstrate analytical methods of predicting weapon effectiveness and the coupling of destructive energy into the target, and the means to translate that information into advanced analytical methods for predicting weapon effectiveness. <ul style="list-style-type: none"> - (U) Completed development of weapon assessment methodologies that significantly reduce requirements for expensive lethality/vulnerability data collection experiments. - (U) Conducted initial phenomenology and weapon effects experiments to provide data for code deficiencies with respect to advanced munition concepts. 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 2502
	<ul style="list-style-type: none"> - (U) Conducted experiments and analyses to investigate phenomena such as synergistic effects from blast and fragments, simultaneous detonations, and penetration dynamics through rock, rubble, and geological material of various hardness. 	
- (U) \$645	<ul style="list-style-type: none"> Develop and demonstrate advanced weapons analytical methodologies. - (U) Validated antimateriel submunition analyses versus actual warhead arena and flight test data. - (U) Enhanced and developed codes for hard target penetration and weapons of mass destruction munition technologies. - (U) Developed joint compatible models to allow evaluation of synthetic aperture radar seeker technology and infrared seeker technology in support of munition tools to make evaluation of munition performance with new technology a much faster, cheaper, and more effective process. 	
- (U) \$792	<ul style="list-style-type: none"> Develop and demonstrate advanced munitions seeker analyses capability. - (U) Continued to validate four-channel pixel-registered active/passive infrared/millimeter wave (IR/MMW) synthetic scene generation code against measured data. - (U) Completed development of six-channel pixel-registered active/passive IR/MMW, visible, ultraviolet synthetic scene generation code. 	
- (U) \$25,720	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 2502
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,433 Develop and demonstrate fuze technology to reduce cost and increase supportability, safety, and performance. <ul style="list-style-type: none"> - (U) Develop a computer simulation of the multipoint initiation system electrical power distribution to support development of future multipoint initiated weapons. - (U) Develop analysis and test methodology to simulate loads equivalent to 2,500 feet/second impact velocity; develop methods to simulate full-scale body response in fuzes using 1/4 scale test procedures and analyses. - (U) Complete ground target clutter generator modification for target simulator. - (U) Complete design studies for a combined target detection device/warhead unit; conduct modeling and simulation of the Target Detection Device to establish optical and image processing algorithm performance; complete warhead fragmentation and lethality assessment to ensure technological feasibility of design; fabricate and arena test warheads to confirm engineering design and warhead models. - (U) Complete fabrication and testing of advanced millimeter wave integrated circuit radio frequency proximity sensors. - (U) \$2,015 Develop and demonstrate affordable explosives for higher performance and lower sensitivity. <ul style="list-style-type: none"> - (U) Perform reclamation experiments on inventory explosives to determine best methods for recovering/disposing of explosives. - (U) Develop technologies for non-shock initiation of explosives during penetration of hard targets. - (U) Reevaluate sensitivity of CL20 composite explosives; test sensitivity and performance of melt castable and cast cure composite explosives. - (U) \$2,359 Develop and demonstrate advanced analytical tools for calculating weapons effects to reduce development time and cost. <ul style="list-style-type: none"> - (U) Complete development of warhead/target interaction models for hard target penetrating weapons. - (U) Complete parallelization and supercomputer rehosting of design code for penetrating weapons - (U) Complete assessment of capability to simulate high-speed, hard target, penetration weapons. - (U) Develop and demonstrate advanced analytical tools for calculating weapon effects that will reduce development time and cost. - (U) \$3,249 Develop and demonstrate advanced weapon airframe and carriage technology for advanced munitions. <ul style="list-style-type: none"> - (U) Demonstrate through wind tunnel and radar cross section testing the ability to carry large loadouts of innovative compressed weapons in a low-drag and survivable manner on tactical aircraft. - (U) Refine the initial design of a rapid response weapon for effectively engaging time-critical targets; develop design guidelines for applying the most promising technologies in future time-critical target weapons. 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	
		PROJECT 2502
– (U) \$5,088	Develop and demonstrate advanced warhead development technologies and advanced kill mechanisms for target defeat. <ul style="list-style-type: none"> – (U) Validate detonation shock dynamics code capability against highly instrumented range experiments. – (U) Assess tantalum materials for application to multimode warheads. – (U) Evaluate performance of thermite systems for enhanced lethality. – (U) Initiate explosive survivability modeling and testing. – (U) Characterize advanced casing and high explosive materials for structural survivability and enhanced target defeat. – (U) Perform technology and system trade studies on very high-speed penetrators. 	
– (U) \$3,065	Develop and extend modular effectiveness vulnerability assessment code (MEVA) to increase accuracy of weapon effectiveness predictions against fixed hardened targets. <ul style="list-style-type: none"> – (U) Utilize tunnel defeat test data to incorporate a tunnel vulnerability module into MEVA architecture; implement configuration management of MEVA to ensure software changes are authorized, validated, documented, and distributed to user community. – (U) Conduct component vulnerability experiments against target power generation/distribution, air handling and fuel pump equipment to support develop of corresponding fragility algorithms for incorporation into the MEVA architecture. – (U) Complete vectorization/code enhancements to speed development of weapon effectiveness assessments and parametric trade studies utilizing distributed processing. 	
– (U) \$3,055	Develop and demonstrate analytical methods of predicting weapon effectiveness and characterize the coupling of destructive energy into the target, and the means to translate that information into advanced analytical methods for predicting weapon effectiveness. <ul style="list-style-type: none"> – (U) Conduct hypersonic penetration experiments into weathered granite using advanced munition concepts; develop a physics-based engineering module for predicting weapon effectiveness against geologic targets. – (U) Integrate synergistic effects damage modules into the MEVA architecture to accurately predict the lethality of advanced munitions concepts against brick and concrete masonry walls. 	
– (U) \$1,146	Develop and demonstrate advanced weapons analytical methodologies. <ul style="list-style-type: none"> – (U) Develop signal processing/jammer model simulations for the anti-jam Global Positioning System technology, and perform analyses for development and risk reduction on flight tests. – (U) Upgrade low-cost autonomous attack submunition six-degree-of-freedom simulations to perform assessments for the anti-materiel munition integrating concept including preflight and postflight test risk reduction; conduct trade study to enable technology development planning. – (U) Provide six-degree-of-freedom missile simulation and subsystem component simulations for weapon technology development concepts. – (U) Provide concept trade studies for hard target munition integrating concept technologies; develop a detailed six-degree-of-freedom simulations for a boosted hard target penetrator. 	

DATE **February 1998**

BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
0602602F Conventional Munitions

- (U) \$24,410 Total

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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 2502
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,004 Develop and demonstrate fuze technology to reduce cost and increase supportability, safety, and performance. <ul style="list-style-type: none"> - (U) Develop advanced single and multi-point initiation systems which will provide increased weapon flexibility and effectiveness. - (U) Develop analyses and test methodologies necessary to simulate loads equivalent to 3,000 feet/second impact velocity. Analyses full-scale body responses in fuzes using 1/4 scale test methodology. - (U) Fabricate, test, and transition an electronic countermeasures-hardened proximity fuze. - (U) Complete design of a digitally driven radio frequency signal generator for proximity fuze applications. - (U) \$2,696 Develop and demonstrate affordable explosives for higher performance and lower sensitivity. <ul style="list-style-type: none"> - (U) Complete protocol test development to determine the probability of survivability of an explosive during a penetration event. - (U) Continue evaluation of castable high performance explosives. - (U) Test and evaluate high density explosives in a high impact environment. - (U) \$2,437 Develop and demonstrate advanced analytical tools for calculating weapons effects to reduce development time and cost. <ul style="list-style-type: none"> - Develop and demonstrate advanced analytical tools for calculating weapons effects to reduce development time and cost. - (U) \$2,241 Develop and demonstrate advanced weapon airframe and carriage technology for advanced munitions. <ul style="list-style-type: none"> - (U) Integrate innovative compressed wing designs for advanced small munitions to extend the range of weapons without sacrificing weapon loadout on aircraft. - (U) Develop initial designs of a flight demonstration vehicle utilizing the information developed under the time-critical target technology program. - (U) \$5,946 Develop and demonstrate advanced warhead development technologies and advanced kill mechanisms for target defeat. <ul style="list-style-type: none"> - (U) Perform tests of antimateriel warhead design with high performance insensitive explosives. - (U) Develop tantalum liner materials for inclusion in antimateriel submunition warhead technology integrated design package. - (U) Complete testing of mechanically induced combustion of energetic materials used in penetrating weapons. - (U) Continue evaluate fuze energy storage systems. - (U) Conduct advanced warhead casing and high explosive materials testing for structural survivability and enhanced target defeat. - (U) Complete initial technology and trade studies and develop two programs to demonstrate enabling very high-speed penetrator technologies. 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602602F Conventional Munitions	PROJECT 2502
<ul style="list-style-type: none"> - (U) \$3,054 Develop and extend modular effectiveness vulnerability assessment code (MEVA) to increase accuracy of weapon effectiveness predictions against fixed hardened targets. <ul style="list-style-type: none"> - (U) Incorporate chemical/biological agent release module into MEVA architecture; conduct configuration management of MEVA to ensure software changes are authorized, validated, documented, and distributed to user community. - (U) Develop new computational modules and integrate into the MEVA architecture to accurately predict the effectiveness of advanced weapon concepts against targets containing chemical and/or biological materiel. - (U) Collect and analyze advanced penetrator performance data against rock, rock rubble, and limestone geologic media to support the development of modularized, physics-based engineering algorithms for tunnel closure weapon effectiveness predictions. - (U) Conduct component vulnerability experiments on weaponized munitions and storage vessels containing chemical/biological agents and develop corresponding fragility algorithms for the release of toxic material due to conventional damage mechanisms (blast and fragmentation). - (U) \$3,011 Develop and demonstrate analytical methods of predicting weapon effectiveness and the coupling of destructive energy into the target, and the means to translate that information into advanced analytical methods for predicting weapon effectiveness. <ul style="list-style-type: none"> - (U) Complete phenomenology and weapon effects experiments to provide code validation data for heavy metal munition lethality algorithms. - (U) Conduct phenomenology and weapon effects experiments to provide data for code deficiencies with respect to hypersonic weapon penetration mechanics. - (U) Develop physics-based modeling techniques with high-speed distributed and parallel processing computer architectures to reduce new weapon research and development experimental requirements. - (U) \$1,215 Develop and demonstrate advanced weapons analytical methodologies. <ul style="list-style-type: none"> - (U) Provide post-flight test analysis for the anti-jam Global Positioning System (GPS) technology, and refine anti-jam detailed six-degree-of-freedom to include system improvements like differential GPS, additional jammer threats, and GPS constellation/operational changes. - (U) Perform pre-flight analysis for the anti-materiel munition integrating concept control flight tests and cable drop tests; provide performance estimates for powered low-cost anti-armor submunition enabling test planning and technology transition analyses. - Extend six Degree-Of-Freedom (DOF) simulation models and conduct seeker, fuze, and guidance/control system assessments for high agility weapons. - Continue support of the counterproliferation weapon technology development; accomplish detailed effectiveness analyses for technology selection/refinement based on new six Degree-Of-Freedom (DOF) flyout and lethality data for hard target munitions. - (U) \$24,604 Total 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	90,590	84,545	65,175	54,146	52,826	53,374	55,152	Continuing	Continuing
2338 Reliability Sciences Technology	10,525	8,235	0	0	0	0	0	0	Continuing
4506 Surveillance Technology	15,890	14,858	11,772	9,125	9,555	9,716	9,997	Continuing	Continuing
4519 Communications Technology	11,846	11,037	12,381	10,626	12,045	11,574	11,814	Continuing	Continuing
4594 Information Technology	12,535	14,896	7,619	8,680	6,791	6,820	6,939	Continuing	Continuing
4600 Electromagnetic Technology	23,902	20,125	13,616	7,172	4,805	4,754	4,896	Continuing	Continuing
5581 Command and Control (C2) Technology	15,892	15,394	19,787	18,543	19,630	20,510	21,506	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Applied Research program is the primary source of new concepts, feasibility demonstrations, and advanced technology for Air Force Command, Control, and Communications (C3). Current developments include: increasing operational availability of C3 systems through improving reliability, diagnostic capability, and electromagnetic environmental performance; improving effectiveness and survivability through secure communications; improving surveillance range and detection capabilities against low-observable threats and enemy electronic countermeasures; and improving the timeliness and quality of data acquisition for decision making. The program addresses six technology areas: reliability sciences; surveillance; communications; information; electromagnetics; and command and control. Note: Decrease in FY 1999 and out is due to elimination of Project 2338, Reliability Sciences Technology.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)			
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	93,215	86,067	84,537	Cont
(U) Appropriated Value	96,615	88,567		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-2,052	-2,978		
b. SBIR	-1,082	-1,044		
c. Omnibus/Other Above Threshold Reprogrammings	-2,789			
d. Below Threshold Reprogrammings				
e. Rescissions	-102			
(U) Other Adjustments to Budget Years Since FY 1998 PB			-19,362	
(U) Current Budget Submit/FY 1999 PB	90,590	84,545	65,175	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)				PROJECT 2338		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2338 Reliability Sciences Technology	10,525	8,235	0	0	0	0	0	0	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> The Air Force requires technology which increases reliability and diagnostic capability for electronic devices and systems while assessing electromagnetic environmental performance. Payoffs are increased system availability and lower life cycle costs. This effort focuses on technology to identify and eliminate design and fabrication characteristics that result in poor reliability. It develops equipment and system reliability and diagnostic techniques to be applied in development of military systems with improved operational readiness and supportability. Areas of emphasis include electronic technology reliability assessment, diagnostic development and integration, design for reliability, and system design and operational assurance.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$3,440 Developed electronic reliability techniques to evaluate new devices in an operational environment and recommend corrective action. <ul style="list-style-type: none"> – (U) Assessed the quality, reliability, and electromagnetic effects performance of advanced electronic packaging concepts. – (U) Defined performance of advanced microelectronics devices and measure their potential for system applications. – (U) Assessed electromagnetic performance and reliability of microwave/millimeter-wave and optoelectronic devices for future systems. – (U) \$3,385 Developed diagnostics technologies and integrated them into existing tools and techniques to address high-priority user requirements. <ul style="list-style-type: none"> – (U) Developed design techniques that integrate computer-aided design with insertion of established built-in test modules. – (U) Developed electromagnetic analysis and measurement tools to predict susceptibility thresholds and radio frequency performance in operational environments. – (U) \$3,700 Developed reliability system design process enhancements to create tools, techniques, and guidelines to improve Command, Control, and Communications (C3) devices. <ul style="list-style-type: none"> – (U) Demonstrated improved systems reliability by characterizing the electrical, electromagnetic, and mechanical stress-inducing parameters of the aerospace operational environment. – (U) Developed computer-based reliability and maintainability tools and techniques for design of electronic circuits, devices, and systems. – (U) \$10,525 Total 										
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	PROJECT 2338
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,710 Develop electronic reliability techniques to evaluate new devices in an operational environment and recommend corrective action. <ul style="list-style-type: none"> - (U) Develop a benchmark reliability and performance database on electronic devices in diverse environments for use in reliability prediction computer-aided design tools and techniques. - (U) Demonstrate the performance of advanced microelectronics devices and their applicability for military systems. - (U) Evaluate electromagnetic performance and reliability of microwave/millimeter-wave and optoelectronic devices for future systems. - (U) \$2,600 Develop diagnostics technologies and integrate them into existing tools and techniques to address high-priority user requirements. <ul style="list-style-type: none"> - (U) Conduct detailed designs for techniques that integrate computer-aided design with insertion of established built-in test modules. - (U) Demonstrate electromagnetic analysis and measurement tools to predict susceptibility thresholds and radio frequency performance in operational environments. - (U) \$2,925 Develop reliability system design process enhancements to create tools, techniques, and guidelines to improve Command, Control, and Communications (C3) devices. <ul style="list-style-type: none"> - (U) Develop integrated and miniaturized multiparameter environmental smart sensors, utilizing micro-electro-mechanical systems technology, which can be applied to military systems such as unmanned aerial vehicles to help support information operations requirements, logistics requirements, and system health monitoring requirements. - (U) Demonstrate computer-based reliability and maintainability tools and techniques for design of electronic circuits, devices, and systems. - (U) \$8,235 Total <p>(U) <u>FY 1999:</u> Not Applicable.</p>		
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	PROJECT 4506
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4506 Surveillance Technology	15,890	14,858	11,772	9,125	9,555	9,716	9,997	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: The Air Force requires advanced surveillance technologies to improve the performance and reduce the cost of Air Force surveillance systems. Major Applied Research areas of interest include: low-observable surveillance; passive surveillance; and advanced processing technologies. Technologies being developed include: advanced passive bistatic radar; spatial coordinate and time processing techniques; sensor and data fusion; signal generation; and advanced array antennas.

(U) FY 1997 (\$ in Thousands):

- (U) \$5,795 Developed, tested, and demonstrated processing technologies and algorithms to enhance small target detection in a complex electromagnetic background.
 - (U) Developed knowledge-based adaptive processing for bistatic ground-to-air radar applications.
 - (U) Completed Phase 2 of the multi-chip module wafer scale signal processor with a capability to perform twenty billion operations per second.
 - (U) Evaluated embedded parallel processing architecture for integrating wafer scale signal processor chips for a real-time signal processor enhancement demonstration.
- (U) \$6,460 Developed technologies and concepts for passive surveillance with emphasis on electronic support measures and bistatics for enhanced detection, track, and classification in severe clutter and jamming environments.
 - (U) Conducted a design evaluation of the advanced airborne radar technology demonstration.
 - (U) Completed data collection, hardware integration, and software development for the static wing testbed; conducted ground-based field test.
 - (U) Conducted extensive field tests and demonstrations using integrated electronic support measures and bistatic passive surveillance and imaging technology on board a small aircraft; enhanced integrated passive surveillance and imaging technology capabilities through an airborne demonstration with a very broad frequency bandwidth controlled phase array.
- (U) \$2,660 Developed, tested, and demonstrated advanced multispectral/multisensor fusion techniques for enhanced target detection and tracking.
 - (U) Developed special purpose artificial intelligence machines for both "expert" and "blackboard" systems.
 - (U) Developed and demonstrated graphical user interface software and platform-based displays; analyzed, tested, and demonstrated integrated knowledge-based fusion concepts.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	
		PROJECT 4506
– (U) \$975	Designed, developed, and tested ultrahigh fidelity microwave electronics for radar applications. <ul style="list-style-type: none"> – (U) Demonstrated optically-based increased dynamic range radar array emulation hardware for test and evaluation of microwave components. – (U) Developed high fidelity power conditioning system for active radar apertures. – (U) Incorporated digital preprocessing in the development of transmit and receive module technology for ground-to-air radar. 	
– (U) \$15,890	Total	
(U) FY 1998 (\$ in Thousands):		
– (U) \$6,110	Develop, test, and demonstrate processing technologies and algorithms to enhance small target detection in a complex electromagnetic background. <ul style="list-style-type: none"> – (U) Demonstrate operational algorithm suites on embedded high performance computers. – (U) Evaluate and assess aircraft interaction algorithms for spatial coordinate and time adaptive processing. – (U) Continue development of multi-chip module wafer scale signal processor with a capability to perform twenty billion operations per second. 	
– (U) \$5,345	Develop technologies and concepts for passive surveillance with emphasis on electronic support measures and bistatics for enhanced detection, track, and classification in severe clutter and jamming environments. <ul style="list-style-type: none"> – (U) Conduct initial advanced airborne surveillance program demonstration tests. – (U) Complete ground-based field tests using the static wing testbed. Analyze effects of aircraft interactions on antenna sidelobe performance. Determine 64-channel receiver data degrees-of-freedom figure-of-merit baseline. Initiate transition of ground testbed to airborne bistatic testbed environment. – (U) Continue integrated electronic support measures and bistatic passive surveillance and imaging technology testing on board a small aircraft using a very broad frequency bandwidth phased array antenna. Initiate technology transition to unmanned aerial vehicle applications. 	
– (U) \$2,753	Develop, test, and demonstrate advanced multispectral/multisensor fusion techniques for enhanced target detection and tracking. <ul style="list-style-type: none"> – (U) Demonstrate and assess special purpose artificial intelligence machines for both “expert” and “blackboard” systems. – (U) Continue development and demonstration of advanced graphical user interface software and platform based displays; analyze, test, and demonstrate integrated knowledge-based fusion concepts. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	
		PROJECT 4506
– (U) \$650	Design, develop, and test ultrahigh fidelity microwave electronics for radar applications.	
	– (U) Complete development of optically-based increased dynamic range radar array emulation hardware for test and evaluation of microwave components.	
– (U) \$14,858	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$1,867	Develop and demonstrate the ability to accurately determine sensor performance from airborne and space based platforms in realistic operational scenarios.	
	– (U) Incorporate advanced detection and tracking algorithms into existing signal processing capabilities and augment capabilities by including advanced jammer and jammer mitigation techniques.	
	– (U) Develop the capability to support sensors such as Joint Surveillance Target Attack Radar System (STARS) by including Synthetic Aperture Radar (SAR) Moving Target Indicator (MTI) capabilities into space- and time-adaptive processing.	
– (U) \$5,762	Develop technologies and concepts for passive surveillance with emphasis on electronic support measures and bistatics for enhanced detection, track, and classification in severe clutter and jamming environments.	
	– (U) Develop enhanced target detection capabilities through adaptive processing of innovative bistatic waveform designs.	
	– (U) Continue the advanced airborne surveillance program demonstration tests.	
	– (U) Transition ground testbed results to airborne bistatic testbed environment.	
	– (U) Continue integrated electronic support measures and bistatic passive surveillance and imaging technology testing and transition technology to unmanned aerial vehicle applications.	
– (U) \$4,143	Develop, test, and demonstrate advanced multispectral and multisensor fusion techniques for enhanced target detection and tracking.	
	– (U) Complete development and demonstration of advanced graphical user interface software and platform based displays; transition multiple integrated fusion algorithms to multi-platform applications.	
	– (U) Develop real-time sensor resource management and multispectral fusion techniques.	
	– (U) Develop power efficient advanced computing architectures for real-time fusion and detection processing	
– (U) \$11,772	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)		PROJECT 4506															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">16,308</td> <td style="text-align: center;">15,562</td> <td style="text-align: center;">15,349</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">15,890</td> <td style="text-align: center;">14,858</td> <td style="text-align: center;">11,772</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0603726F, C3 Subsystems Integration. - (U) PE 0603789F, C3 Advanced Development. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	16,308	15,562	15,349	Cont	(U) Current Budget Submit/FY 1999 PB	15,890	14,858	11,772	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	16,308	15,562	15,349	Cont														
(U) Current Budget Submit/FY 1999 PB	15,890	14,858	11,772	Cont														
Project 4506	Page 9 of 25 Pages	Exhibit R-2 (PE 0602702F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602702F Command, Control, and Communication (C3)				PROJECT 4519	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4519 Communications Technology	11,846	11,037	12,381	10,626	12,045	11,574	11,814	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: The Air Force requires technologies which will provide worldwide communications. The rapid build-up of U.S presence abroad, via rapid application of air power, requires assured connectivity providing reliable, responsive, affordable transfer of information using all available communications media. This program provides the technologies for: multi-level, secure, seamless networks; advanced communications processors; anti-jam and low probability of intercept techniques, such as spread spectrum and adaptive null steering; lightweight antennas and phased array antennas; and modular, programmable, low-cost radios and Command, Control, and Communications (C3) across the electromagnetic and optical spectrums. It includes technologies for advanced processors and devices, advanced network protocols, artificial intelligent communications management and control, advanced algorithms, and enabling processing techniques.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,680 Developed critical communications technologies employing programmable devices, processing technologies, and monolithic microwave integrated circuits to provide survivable radios and transceivers. <ul style="list-style-type: none"> - (U) Developed and demonstrated on-demand multiple access, packet switching, imagery compression, and reachback technologies. - (U) Designed reduced weight, low-cost minimum-drag antenna solutions for airborne vehicle communications systems. - (U) Developed improved nulling algorithms, monolithic microwave integrated circuits, and packaging technologies for advanced ultra-high frequency (UHF) and super-high frequency (SHF) communications. - (U) Developed a joint Air Force/Army high capacity trunk radio for tactical mobile and fixed nodes. - (U) Investigated joint military use of personal communications systems. - (U) \$5,776 Developed technologies for improved security, survivability, timeliness, and reconstruction of communications networks. <ul style="list-style-type: none"> - (U) Demonstrated selected multiple access and asynchronous switching protocols for theater applications. - (U) Conducted initial demonstration of standards-based, interactive, secure user services which optimally employ the underlying commercially compatible communications network. - (U) Demonstrated intelligent, survivable network management that provides secure, system-wide optimization of resource usage. 									
Project 4519		Page 10 of 25 Pages				Exhibit R-2 (PE 0602702F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	0602702F Command,Control, and Communication (C3)	4519
<ul style="list-style-type: none"> - (U) \$2,390 Developed advanced electronic and photonic processors, advanced network protocol, advanced algorithms, and enabling processing technologies essential for survivable communications. <ul style="list-style-type: none"> - (U) Developed specifications for the next generation smart networking radio, incorporating proven smart adaptive signal processing multiple access and networking technologies. - (U) Developed and demonstrated potentially high payoff communications signal processing technologies applicable to future smart radio systems. - (U) \$11,846 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,440 Develop critical communications technologies employing programmable devices, processing technologies, and monolithic microwave integrated circuits to provide survivable radios and transceivers. <ul style="list-style-type: none"> - (U) Develop high frequency and super-high frequency on-board packet switching, advanced communications protocols, imagery and video transmission, and reachback technologies. - (U) Develop reduced weight, low-cost, minimum-drag subsystems for air vehicle communications systems. - (U) Design and breadboard improved nulling algorithms, monolithic microwave integrated circuits, and crosslink and packaging technology for satellite and unmanned aerial vehicle platforms. - (U) Demonstrate fixed high capacity trunk radio with the Army. - (U) Specify required improvements to personal communications systems for military use. - (U) \$5,275 Develop technologies for improved security, survivability, timeliness, and reconstruction of communications networks. <ul style="list-style-type: none"> - (U) Develop intelligent interface or bridge between mobile wireless networks and wired/fiber network. - (U) Complete demonstration tests of standards-based, interactive, secure user services which optimally employ the underlying commercially compatible communications network. - (U) Demonstrate cooperation between network management entities to optimize information flow throughout the overall information system including a dynamic applications interface and user responsive security mechanisms. - (U) Demonstrate intelligent, survivable network management that provides secure, system-wide optimization of resource usage. - (U) \$2,322 Develop advanced electronic and photonic processors, advanced network protocol, advanced algorithms, and enabling processing technologies essential for survivable communications. <ul style="list-style-type: none"> - (U) Design, test, and evaluate smart networking radio subsystems. - (U) Develop and demonstrate new adaptive communications signal processing and control technologies. - (U) \$11,037 Total 		
Project 4519	Page 11 of 25 Pages	Exhibit R-2 (PE 0602702F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	PROJECT 4519
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$3,460 Develop critical communications technologies employing programmable devices, processing technologies, and monolithic microwave integrated circuits to provide global connectivity to aerospace forces. <ul style="list-style-type: none"> – (U) Continue development of ultra-high frequency (UHF) and super-high frequency (SHF) on-board packet switching, advanced communications protocols, imagery and video transmission, and reachback technologies. – (U) Demonstrate reduced weight, low-cost, minimum-drag subsystems for air vehicle communications systems. – (U) Demonstrate highly efficient nulling algorithms, monolithic microwave integrated circuits, and packaging technologies for advanced spacecraft antennas. – (U) Conduct joint Air Force/Army demonstration of high capacity trunk radio. – (U) Initiate study to evaluate 94 Gigahertz (GHz) and 120 GHz solidstate power amplifier, frequency synthesizer, and related component technologies to exploit extremely-high frequency domain. – (U) \$4,666 Develop assurance of services (i.e., high probability that needed links will be available) and universal transaction services (i.e., capability to process requests from a variety of different systems) technologies for improved security, survivability, timeliness, and reconstruction of communications networks. <ul style="list-style-type: none"> – (U) Demonstrate early intelligent interface capabilities between mobile wireless network and wired/fiber network. – (U) Augment cooperative network management system to include artificial intelligence-based control mechanisms. – (U) Demonstrate intelligent, survivable network management that provides secure, system-wide optimization of resource usage. – (U) \$3,255 Develop advanced communications signal processors, advanced network protocol, advanced algorithms, and enabling processing technologies essential for survivable communications. <ul style="list-style-type: none"> – (U) Demonstrate initial smart networking radio and subsystems. – (U) Transition smart networking radio and associated technologies to advanced development. – (U) \$1,000 Develop Defensive Information Warfare (IW) tools and technology to ensure information protection and security of Air Force Information Systems. <ul style="list-style-type: none"> – (U) Initiate development of computer pathology technology for malicious code analysis, development of tools to automate computer forensics data discovery and technology to handle encrypted environments. – (U) Initiate efforts to develop and collect a database of attack indicators for preemptive Defensive Information Warfare. – (U) Initiate development of Defensive Information Operations planning tools. – (U) \$12,381 Total 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)				PROJECT 4594		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
4594 Information Technology	12,535	14,896	7,619	8,680	6,791	6,820	6,939	Continuing	Continuing	
<p>(U) A. Mission Description and Budget Item Justification: The Air Force requires technologies which improve and automate capabilities to process, manage, generate, fuse, exploit, interpret, and disseminate timely information. This project: improves recording, storage, and retrieval of high data-rate, large volume data; pursues speech processing technologies for signal exploitation and exploiting unintentional emissions; develops technology for correlation and fusion of multisource data; develops natural language technologies that can read text and extract data of interest; develops tools and techniques to build tailorable architectures that scale command level information production systems down to the wing and squadron level; provides advanced processing techniques for receipt, correlation analysis, and display of target reports from advanced sensors; supports advanced weapon systems through the exploration of multispectral, multisource imagery; and provides advanced techniques for mapping, charting, and geodesy data processing.</p> <p>(U) FY 1997 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$7,900 Developed processing technologies responsive to operational deficiencies by improving information timeliness, reliability, and accessibility. <ul style="list-style-type: none"> - (U) Integrated three-dimensional memory, error correction algorithms, and optical device technologies to develop enhanced storage and retrieval devices with reduced size, weight, and power requirements at lower cost; evaluated the first generation erasable media. - (U) Developed processing algorithms to automatically sort and route large volumes of communication signals to assist information analysts. - (U) Developed techniques that pro-actively correlate active radar signals with processing of non-cooperative signal emanations to support the release of beyond-visual-range weapons against high confidence air targets. - (U) Incorporated counter information technologies into the model abstraction and advanced data display techniques to enhance the exploitation of electronic imagery/information. - (U) \$2,290 Developed advanced information data handling techniques to automatically extract event data and update databases for prediction purposes. <ul style="list-style-type: none"> - (U) Developed techniques to build intelligent, single point, multimedia databases to provide the warfighter global awareness. - (U) Developed analytical tools which exploit message processing techniques to extract multimedia information for concise, efficient display to the warfighter. - (U) Integrated techniques to configure and manage a scaleable distributed information computing environment. 										
Project 4594		Page 14 of 25 Pages				Exhibit R-2 (PE 0602702F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	PROJECT 4594
<ul style="list-style-type: none"> - (U) \$2,345 - (U) \$12,535 	<ul style="list-style-type: none"> Developed sensor exploitation techniques for faster and more efficient imaging to support targeting, planning, and mission execution. - (U) Developed Phase 2 techniques to improve the methodology required to manage and query imagery databases. - (U) Developed information currency techniques and data consistency techniques to support combat imagery/information systems. - (U) Applied modeling techniques which exploit aircraft mission video data to satisfy battle damage assessment requirements. Total 	
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,970 - (U) \$2,245 - (U) \$2,291 	<ul style="list-style-type: none"> Develop processing technologies responsive to operational deficiencies by improving information timeliness, reliability, and accessibility. - (U) Demonstrate read only three-dimensional memory configurations with error correction to develop enhanced storage and retrieval devices with reduced size, weight, and power requirements at lower cost; develop and assess second generation erasable media. - (U) Complete processing algorithm development to automatically sort and route large volumes of communication signals to assist information analysts. - (U) Develop processing technologies to exploit non-cooperative target attributes to support high confidence air target identification, continue development of pro-active fusion model for abstraction and inference of target identifications, continue developing techniques to correlate active radar tracks with passive signal identification techniques, develop advanced techniques for non-cooperative target identifications through the exploitation of target emissions. - (U) Evaluate and assess first generation model abstraction and advanced data display techniques which incorporate counter information technologies to enhance the exploitation of electronic imagery/information. Develop information data handling techniques to automatically extract event data and update databases for prediction purposes. - (U) Integrate advanced techniques to build intelligent, single point, multimedia databases to provide the warfighter global awareness. - (U) Integrate analytical tools which exploit message processing techniques to extract multimedia information for concise, efficient display to the warfighter. - (U) Evaluate machine learning techniques to configure and manage a scaleable distributed information computing environment. Develop sensor exploitation techniques for faster and more efficient imaging to support targeting, planning, and mission execution. - (U) Evaluate and assess Phase 2 imagery data base query developmental capability. - (U) Integrate information currency techniques and data consistency techniques to support combat imagery/information systems. 	
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	
		PROJECT 4594
<ul style="list-style-type: none"> - (U) Integrate modeling techniques which exploit aircraft mission video data to satisfy battle damage assessment requirements. - (U) \$2,390 Develop protein-based optical memories for high density mass storage systems of the future. <ul style="list-style-type: none"> - (U) Evaluate and assess a variety of protein-based material chemistry. - (U) Demonstrate data recording into selected protein-based material and determine data capacity and throughput rates. - (U) Conduct trade off analysis between holograms and bit-plane recording schemes for storage system designers. - (U) \$14,896 Total 		
(U) <u>FY 1999 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$1,880 	Develop information exploitation capabilities for imagery and electromagnetic signals and transition the capability to command and control systems in direct support of global engagement for information superiority. <ul style="list-style-type: none"> - (U) Develop video and imagery exploitation techniques to tag products with latitude, longitude, and elevation in support of combat information systems. - (U) Enhance, test, and evaluate processing algorithms to automatically sort and route large volumes of communication signals. 	
<ul style="list-style-type: none"> - (U) \$1,914 	Develop information warehousing, storage and retrieval technologies to provide timely warfighter access to a complete suite of Command, Control, Communications, Computers, and Intelligence information. <ul style="list-style-type: none"> - (U) Continue development of protein-based optical memories by increasing memory capacity to meet multi-dimensional information requirements. - (U) Evaluate techniques to automatically optimize the performance of multimedia databases to provide the warfighter with improved near-real-time global awareness. 	
<ul style="list-style-type: none"> - (U) \$1,960 	Develop technologies for real-time and stored data fusion to support dynamic planning. <ul style="list-style-type: none"> - (U) Develop and integrate technologies to provide a common operating picture that differentiates potential targets as friend, foe, or neutral in sufficient time, with high confidence, and at the requisite range to support weapons release and engagement decisions. - (U) Develop techniques that provide feedback to data collection operations to improve the quality of targeting. 	
<ul style="list-style-type: none"> - (U) \$1,865 	Develop advanced technologies and approaches for the acquisition, analysis, and timely dissemination of intelligence information. <ul style="list-style-type: none"> - (U) Develop techniques that simulate operational loading of intelligence applications to provide performance and interoperability measurements. - (U) Develop techniques to automatically generate and modify advanced information data handling applications improving the usability and timeliness of warfighter information. 	

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BUDGET ACTIVITY
2 - Applied Research

PE NUMBER AND TITLE
**0602702F Command,Control, and Communication
(C3)**

- (U) \$7,619 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602702F Command, Control, and Communication (C3)				PROJECT 4600		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
4600 Electromagnetic Technology	23,902	20,125	13,616	7,172	4,805	4,754	4,896	Continuing	Continuing	
<p>(U) A. Mission Description and Budget Item Justification: This project consists of three subset technologies: electromagnetics; solid state sciences; and photonics. Future surveillance, communications, and imagery/information processing systems will require improved technology for the generation, control, processing, and radiation of electromagnetic and optical energy to reduce system cost, improve system sensitivity, and increase processing rates. Promising technologies for improving Command, Control, and Communications (C3) systems are electromagnetic propagation and scattering (from targets and clutter), and monolithic microwave and millimeter-wave integrated components and antennas. This project develops: a technology base for electronic and photonic devices and device materials for C3 systems; optical technology for electronic data processing and storage; real-time target recognition and high-speed fiber optic interconnects; and control techniques for large phased array antennas. It also characterizes phenomena for low-observable surveillance.</p> <p>(U) FY 1997 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$6,937 Developed electromagnetic technologies for advanced surveillance and communications systems applications. <ul style="list-style-type: none"> - (U) Conducted experimental assessment of techniques to improve bistatic signal-to-clutter ratios for low radar cross section target detection. - (U) Finalized algorithm and initiated hardware development for infrared small target spectral discriminator. - (U) \$5,945 Developed advanced materials and components capable of higher processing speeds at reduced power levels for telecommunications and survivable server applications. <ul style="list-style-type: none"> - (U) Designed and fabricated brassboard, high-temperature transmit array; designed, fabricated, and tested monolithic low noise amplifier. - (U) Developed substrates for aluminum/gallium nitride for high-power, high temperature, and optoelectronic applications, using new crystal growth methods. 										
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	
<p>– (U) \$11,020 Developed photonic components and related materials for insertion into core Command, Control, and Communications (C3) programs.</p>		
<ul style="list-style-type: none"> – (U) Implemented recursive tracking techniques for infrared focal plane arrays to exploit unique qualities of Schottky barrier technology. 		
<ul style="list-style-type: none"> – (U) Developed optical sources, detectors, and modulators for high-speed analog fiber optic links. 		
<ul style="list-style-type: none"> – (U) Developed 'smart' pixel optoelectronics technology for high-speed parallel signal processing. 		
<ul style="list-style-type: none"> – (U) Conducted Phase 1 development of the ultra-high-speed multiple access testbed and associated components for unique switching architecture, radar processors, and communications protocols. 		
<ul style="list-style-type: none"> – (U) Conducted Phase 1 development of unique photonic signal processor brassboards to demonstrate optical logic and optical neural networks. 		
<ul style="list-style-type: none"> – (U) Demonstrated radio frequency optical beamforming and anti-jamming processors for radar and communication systems. 		
<p>– (U) \$23,902 Total</p>		
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<ul style="list-style-type: none"> – (U) \$6,010 Develop electromagnetic technologies for advanced surveillance and communications systems applications. 		
<ul style="list-style-type: none"> – (U) Evaluate digital beamforming algorithms for multiple simultaneous beams; evaluate phased array correction algorithms; develop wide-bandwidth techniques for arrays of patch radiators; evaluate competing designs for coupling signals within multilayer antenna structures. 		
<ul style="list-style-type: none"> – (U) Develop algorithms, based on bistatic adaptive polarimetry, to extract targets from clutter; develop propagation models for channel distortion on wideband communications and surveillance links. 		
<ul style="list-style-type: none"> – (U) \$4,975 Develop advanced materials and components capable of higher processing speeds at reduced power levels for telecommunications and survivable server applications. 		
<ul style="list-style-type: none"> – (U) Develop Generation II indium phosphide crystal growth apparatus based on experiment-based modeling and simulation. 		
<ul style="list-style-type: none"> – (U) Develop nitride-based substrates for low-defect-density aluminum/gallium nitride films for high-power, high temperature, and optoelectronic applications. 		
<ul style="list-style-type: none"> – (U) Evaluate low noise amplifier using strain free, high indium content channels on gallium arsenide; develop array techniques for evaluating photonically triggered, wide bandwidth microwave sources. 		
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BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	
		PROJECT 4600
– (U) \$9,140	Develop photonic components and related materials for insertion into core Command, Control, and Communications (C3) programs. <ul style="list-style-type: none"> – (U) Develop a multiband, infrared imaging spectrometer capable of creating two-dimensional infrared data on a high value target. – (U) Fabricate optical sources, detectors and modulators for high-speed analog fiber optic links. – (U) Fabricate 'smart' pixel optoelectronics technology for high-speed parallel signal processing. – (U) Conduct Phase 2 development of the ultra-high-speed multiple access testbed and associated components for unique switching architecture, radar processors, and communications protocols. – (U) Conduct Phase 2 development of unique photonic signal processor brassboards to demonstrate optical logic and optical neural networks. – (U) Integrate radio frequency optical beamforming and anti-jamming processors for radar and communication systems. 	
– (U) \$20,125	Total	
<u>(U) FY 1999 (\$ in Thousands):</u>		
– (U) \$4,700	Develop electromagnetic technologies for advanced surveillance and communications systems applications. <ul style="list-style-type: none"> – (U) Demonstrate digital beam nulling techniques and demonstrate new computer codes for predicting antenna performance. – (U) Evaluate new computer codes for fast and accurate prediction of the bistatic radar cross section of complex targets. – (U) Validate the use of advanced bistatic clutter models for long range detection of low observable airborne targets. 	
– (U) \$1,175	Develop advanced electromagnetic materials and components capable of higher processing speeds for sensing and communications applications. <ul style="list-style-type: none"> – (U) Evaluate alloys of nitrides with arsenides and phosphides for microwave transmitters and space-based ultraviolet sensors. – (U) Demonstrate performance of 120 Ghz low noise amplifiers using optimized materials. – (U) Demonstrate three-dimensional, optically excited, antenna array. 	
– (U) \$5,880	Develop photonic sub-systems and components for control and processing of both data and radio frequency signals <ul style="list-style-type: none"> – (U) Develop, integrate and test photonic sources, detectors, and modulators for high-speed radio frequency distribution systems. – (U) Complete fabrication of smart pixel optoelectronic components for high-speed parallel signal processing. – (U) Develop radio frequency photonic beamforming and anti-jamming processors. – (U) Investigate photonic analog-to-digital (A/D) converters. – (U) Develop photonic interconnection architectures for high performance computers. 	
– (U) \$1,861	Develop advanced concepts for electromagnetic apertures. <ul style="list-style-type: none"> – (U) Investigate beam forming techniques for distributed and for conformal apertures. – (U) Research the feasibility of digital beam forming and light-weight arrays for distributed, wide-baseline satellite arrays. 	
– (U) \$13,616	Total	
Project 4600	Page 20 of 25 Pages	Exhibit R-2 (PE 0602702F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 2 - Applied Research			PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)					PROJECT 5581			
COST (\$ In Thousands)			FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
5581 Command and Control (C2) Technology			15,892	15,394	19,787	18,543	19,630	20,510	21,506	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: The Air Force requires Command and Control (C2) technologies which provide the next generation of weapon systems with improved processing and presentation of information for real-time battle management. Technologies being developed in this project will increase capability, quality, and reliability while reducing the cost of computer resources in C2 systems. Work in this project focuses on developing advanced C2 computer software systems capable of providing vast improvements in military decision making. It also develops software engineering analysis tools, software development methodologies, and software quality specification and assessment techniques. It develops technology for distributed systems, data bases, and fault tolerance mechanisms; and knowledge-based technologies, systems, and data bases.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5,880 Developed intelligent information technologies for real-time battle management and C2 supporting time-critical air operations. <ul style="list-style-type: none"> - (U) Demonstrated integration of planning technology using autonomous software agents and mixed initiative scheduling toolbox. - (U) Developed and demonstrated dialog-based, man-machine integration planning task. - (U) Developed and demonstrated evaluation criteria for intelligent information systems. - (U) \$4,862 Developed software technologies to provide increased capability, quality, and reliability while reducing support cost. <ul style="list-style-type: none"> - (U) Developed Phase 1 of the high level requirements engineering language with scenario generation for the requirements engineering environment. - (U) Evaluated concept design approaches and visualization techniques for parallel processing systems, parallel object-oriented programming methods, and advanced techniques for real-time parallel processing analyses. - (U) Completed development of benchmarks for parallel processing software. - (U) \$5,150 Developed enabling technology for distributed computing and database technology using cluster techniques to allow secure processing and management of multimedia information by commanders at all echelons. <ul style="list-style-type: none"> - (U) Demonstrated asynchronous switching technology as a local interconnect mechanism for shared collaborative context workspace across a distributed computing environment. - (U) Demonstrated feasibility of an optical storage and retrieval mechanism for multimedia database management brassboard. - (U) Demonstrated feasibility application-based reconfiguration of multiple distributed computing clusters. - (U) \$15,892 Total 											
Project 5581			Page 22 of 25 Pages				Exhibit R-2 (PE 0602702F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	
PROJECT 5581		
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$5,714	Develop intelligent information technologies for real-time battle management and command and control for time-critical air operations.	
	– (U) Develop high performance computational mechanism for knowledge discovery/mining and information integration for massive knowledge-based systems.	
	– (U) Develop fully autonomous planning technology for inclusion in software toolbox.	
	– (U) Demonstrate full-dialog man-machine interface for integration into planning task.	
	– (U) Apply evaluation criteria for high performance knowledge bases.	
– (U) \$4,760	Develop software technologies to provide increased capability, quality, and reliability while reducing support cost.	
	– (U) Continue development of the high level requirements engineering language with scenario generation for the requirements engineering environment and other advanced technologies for requirements elicitation, specification, and validation.	
	– (U) Develop architecture-directed synthesis technology and demonstrate the formal synthesis of high assurance software.	
	– (U) Develop technology to support modeling and analysis of evolvable software, including dynamic language support.	
	– (U) Develop concept design approaches and visualization techniques for parallel processing systems, parallel object-oriented programming methods, and advanced techniques for real-time parallel processing analyses.	
	– (U) Expand baseline set of benchmarks for parallel processing software to include provisions for real-time systems.	
– (U) \$4,920	Develop enabling technology for distributed computing and database technology using cluster techniques to allow secure processing and management of multimedia information by commanders at all echelons.	
	– (U) Evaluate asynchronous switching technology as a local interconnect mechanism for shared collaborative context workspace across a distributed computing environment.	
	– (U) Evaluate utility of optical storage multimedia database management brassboard.	
	– (U) Evaluate utility of application-based reconfiguration of multiple distributed computing clusters.	
– (U) \$15,394	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602702F Command,Control, and Communication (C3)	PROJECT 5581
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,278 Develop intelligent information technologies for real-time battle management and command and control for time-critical air operations. <ul style="list-style-type: none"> - (U) Demonstrate integration of planning technology for incremental plan refinement and synchronization of resources. - (U) Demonstrate high performance knowledge base technology for coordination, cooperation, and negotiation. - (U) Develop and demonstrate preplan-to-react planning technology for noncontinuous planning. - (U) Develop and demonstrate tools and techniques for collaborative intelligent systems including intelligent agents and knowledge bases. - (U) \$6,233 Develop software technologies to provide increased capability, quality, and reliability while reducing support cost. <ul style="list-style-type: none"> - (U) Complete development of high level requirements engineering language (i.e., methods to identify, document, track, and review user requirements) and scenario generation (i.e., creating test cases to ensure the requirements are accurate and complete). - (U) Continue development of architecture-centered technology that provides easier-to-design and easier-to-maintain software. - (U) Continue development of technology to support modeling and analysis of evolvable software, including dynamic language support. - (U) \$6,276 Develop distributed computing and database technology to enable secure processing and management of multimedia information, ensuring access by commanders at all echelons. <ul style="list-style-type: none"> - (U) Apply asynchronous switching technology to shared collaborative workspaces across a distributed computing environment. - (U) Integrate optical storage multimedia database management systems. - (U) Develop and demonstrate brassboard reconfiguration of multiple distributed sets of nodes for command and control systems. - (U) \$19,787 Total 		
Project 5581	Page 24 of 25 Pages	Exhibit R-2 (PE 0602702F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 2 - Applied Research				PE NUMBER AND TITLE 0602805F Dual Use Applications Program (DUAP)				PROJECT 4770	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4770 Dual Use Science and Technology (S&T)	0	0	19,606	18,253	18,180	18,098	18,117	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Applied Research program allows the Air Force to leverage industry investments in advanced technologies that are mutually advantageous to both the Air Force and industry. One of the program's goals is to incorporate dual use technology as part of the standard Air Force S&T way of doing business. Cost sharing requires both industry and laboratory commitment to the development effort resulting in efforts that are both militarily relevant and commercially viable. Specific projects are determined through annual solicitation(s). Another goal is to utilize FY 1997 Defense Authorization Act Section 804, Other Transactions authority, as part of the Dual Use S&T program in order to educate the Air Force S&T workforce in non-traditional or commercial contracting practices. Dual use technology was previously funded by the Defense Advanced Research Projects Agency (DARPA), first under the Technology Reinvestment Program (TRP) and then under DUAP. In FY 1997, the decision was made to begin transferring responsibility for DUAP from DARPA to the Services. The two existing DUAP efforts, DUAP S&T and Commercial Operations and Support Savings Initiative (COSSI), were split and transferred into Service 6.2 and 6.4 PEs, respectively. This PE is the Dual Use S&T effort for the Air Force.

(U) FY 1997: Not Applicable.

(U) FY 1998: Not Applicable.

(U) FY 1999 (\$ in Thousands):

- (U) \$10,000 Develop air vehicle technologies that extend the life and improve the performance of both Air Force and commercial fixed wing air vehicles. Areas of research include improving flight control, lightweight structures, common electronics, and vehicle subsystems.
- (U) \$5,000 Develop information technologies that improve the capability of both aerospace command and control, and commercial communications and awareness. Areas of research include intelligent information systems, communication systems, information fusion, and collaborative environment development.
- (U) \$4,606 Develop space technologies that will reduce the cost and improve the capability of both Air Force and commercial space vehicles and launch systems. Areas of research include improved space vehicle survivability, space vehicle control, and space-based sensing.
- (U) \$19,606 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998	
BUDGET ACTIVITY 2 - Applied Research	PE NUMBER AND TITLE 0602805F Dual Use Applications Program (DUAP)			PROJECT 4770
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	0	0	0	0
(U) Appropriated Value	0	0	0	0
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions				
b. SBIR				
c. Omnibus/Other Above Threshold Reprogrammings				
d. Below Threshold Reprogrammings				
e. Rescissions				
(U) Adjustments to Budget Year Since FY 1998 PB			19,606	
(U) Current Budget Submit/FY 1999 PB	0	0	19,606	Cont
(U) Change Summary Explanation:				
<p>Funding: Dual use technology was previously funded by the Defense Advanced Research Projects Agency (DARPA), first under the Technology Reinvestment Program (TRP) and then under DUAP. In FY 1997, the decision was made to begin transferring responsibility for DUAP from DARPA to the Services. The two existing DUAP efforts, DUAP S&T and Commercial Operations and Support Savings Initiative (COSSI), were split and transferred into Service 6.2 and 6.4 PEs, respectively. This PE is the Dual Use S&T effort for the Air Force.</p> <p>Technical: Not Applicable.</p> <p>Schedule: Not Applicable.</p>				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
- (U) This project will be coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
<p>Project 4770 Page 2 of 2 Pages Exhibit R-2 (PE 0602805F)</p>				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603106F Logistics Systems Technology	PROJECT 2745
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2745 Logistics Performance and Support Technology	17,059	14,502	8,677	7,883	10,381	10,523	10,810	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1999, three projects (Project 2745, Logistics for Contingency Operations and Weapons Systems Support; Project 2940, Technology for Design and Maintenance; and Project 2950, Improved Logistics and Maintenance Performance) are combined into a single project (Project 2745, Logistics Performance and Support Technology). The total project costs for Project 2745 reflect this consolidation.

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program develops and demonstrates cost-effective technologies to improve the design, performance, and support of current and future weapon systems. This program directly supports two of the six Air Force Core Competencies: Rapid Global Mobility and Agile Combat Support. It will also incorporate human operator, maintenance, and support considerations into the weapon systems design process and will make engineering, product support, and maintenance data electronically available throughout weapon systems' life cycles. It will provide more realistic logistics planning and combat capability assessment tools, provide technologies to reduce deployment airlift and footprint requirements, improve logistics information and command and control and asset visibility, provide critical logistics risk reduction technology, and help control total weapon systems costs.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603106F Logistics Systems Technology	PROJECT 2745
<p>U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 1,463 Developed and demonstrated fire suppression/extinguishing technologies. <ul style="list-style-type: none"> - (U) Completed testing on the gas generator technology for aircraft fire suppression systems and made available for transition. - (U) Further developed and flight tested the inflatable bag extinguisher technology for aircraft fire suppression. - (U) \$ 1,498 Developed and demonstrated repair techniques for battle damaged/accident damaged aircraft. <ul style="list-style-type: none"> - (U) Field demonstrated and verified concepts for repairing and measuring battle damaged low-observable structures. - (U) Evaluated technologies for repairing battle damaged composite structures. - (U) \$ 2,612 Developed processes, models, technologies, and equipment to enhance contingency operations while decreasing the logistics footprint. <ul style="list-style-type: none"> - (U) Designed and evaluated technologies for multi-function modular aerospace ground equipment that reduce support costs and deployment footprint. - (U) Designed and evaluated technologies for improved supportability and operational efficiency of support equipment and materiel handling equipment. - (U) \$ 1,767 Developed engineering design, analysis methods, and technologies to improve Air Force maintenance and address requirements for improved reliability/maintainability. <ul style="list-style-type: none"> - (U) Created and validated methods for documenting maintenance technician performance requirements for automatic insertion in the Logistics Support Analysis Record. - (U) Developed criteria/metrics for design engineering assessment of system deployment footprint, supportability, airlift/transportation requirements, and on-site support. - (U) \$ 2,567 Developed and demonstrated analysis methods to identify and meet Air Force logistics needs: improve aircraft repair/support methods. <ul style="list-style-type: none"> - (U) Built and demonstrated data collection and decision support technologies for operational logistics requirements. - (U) Tested the flexibility and accuracy of this multi-user technology with commercial analytical methods. - (U) Defined requirements for analytic tool suite to improve the efficiency and affordability of the wing/depot repair process. - (U) \$ 1,375 Completed development/demonstrated engineering design trade off methods and software tools to make acquisition support of Air Force systems more affordable. - (U) \$ 4,333 Developed and demonstrated methodologies and technologies to evaluate the benefits of electronic technical data for planning and implementing various types of field and depot maintenance. <ul style="list-style-type: none"> - (U) Developed aircraft battle damage assessment aid demonstration system. - (U) Designed a system to demonstrate integrated technical information for the Air Logistics Centers. - (U) \$ 1,444 Developed and demonstrated technologies for improved logistics planning and deployed maintenance operations. <ul style="list-style-type: none"> - (U) Completed information analysis required to develop technologies to improve wing level logistics planning environment. - (U) \$17,059 Total 		
Project 2745	Page 2 of 6 Pages	Exhibit R-2 (PE 0603106F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603106F Logistics Systems Technology	PROJECT 2745
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> – (U) \$ 1,219 Continue to develop repair technologies for battle and accident damaged aircraft. <ul style="list-style-type: none"> – (U) Field test, document, and transition composite and low-observable structure repair technologies. – (U) Compare and assess available commercial technologies to achieve minimized sound, thermal, and pollution signature and operational residuals. <li> <ul style="list-style-type: none"> – (U) \$ 3,592 Continue to develop technologies to enhance rapid logistics contingency planning/operations directed towards rapid response, reduce footprint, and improve asset distribution management (place, time, materials, quantities) for logistics support. <ul style="list-style-type: none"> – (U) Develop advanced deployment/process planning analysis and execution tools; identify essential elements required to support rapid response forces with required initial and sustaining support elements. – (U) Fully define operational requirements for next generation highly reliable, reconfigurable, and easily deployable multi-function, modular support equipment. – (U) Continue technology development to reduce airlift requirements and on-site footprint using multifunction support equipment. <li> <ul style="list-style-type: none"> – (U) \$ 2,492 Continue development of engineering design, analysis methods, and technologies to improve Air Force maintenance and support to improve reliability, maintenance, and deployability. <ul style="list-style-type: none"> – (U) Complete and transition advanced computer-based maintainability assessment and support data generation using high fidelity human performance models and maintenance task simulations. – (U) Complete and transition analytic tool suites to improve the efficiency and affordability of the wing/depot repair process. <li> <ul style="list-style-type: none"> – (U) \$ 2,211 Complete, demonstrate, and transition analysis tools to ensure tight correlation between specific operational user requirements and system acquisition, repair, and modification. <ul style="list-style-type: none"> – (U) Develop and assess technologies to balance operational user requirements with affordability, reliability, and supportability requirements. – (U) Complete and demonstrate impact of collaborative technologies for distributed, multi-media, multi-user assessments, trade off, and coordination for consolidation and prioritization of operational logistics requirements. <li> <ul style="list-style-type: none"> – (U) \$ 4,988 Continue to develop and demonstrate technologies to evaluate the benefits of electronic technical data for planning and implementing various types of field, depot, and deployed maintenance. <ul style="list-style-type: none"> – (U) Continue aircraft battle damage assessment aid demonstration system development. – (U) Complete, demonstrate, and transition program for integrated technical information for the Air Logistics Centers. <li> <ul style="list-style-type: none"> – (U) \$14,502 Total 		
Project 2745	Page 3 of 6 Pages	Exhibit R-2 (PE 0603106F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603106F Logistics Systems Technology	2745
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,230 Continue development of technologies to enhance rapid contingency planning/operations directed towards rapid response, reduce footprint, and improve “just-in-time” logistics support. <ul style="list-style-type: none"> - (U) Field demonstrate advanced deployment planning and execution process planning and analysis tools; identify essential elements required to support rapid response forces with required initial and sustaining support elements. - (U) Evaluate, develop and integrate tools and process improvements identified as shortfalls as a result of the field demonstration. - (U) \$2,572 Continue to develop technologies for next generation, multi-function, modular support equipment that is highly reliable, reconfigurable, and easily deployable. <ul style="list-style-type: none"> - (U) Demonstrate technologies that reduce airlift requirements and on-site footprint for multifunction support equipment. - (U) \$2,253 Continue to develop and demonstrate technologies to improve deployed maintenance operations and evaluate the benefits of electronic technical data to support deployed maintenance. <ul style="list-style-type: none"> - (U) Field test and demonstrate aircraft battle damage assessment aiding technology. - (U) \$ 622 Continue to develop and demonstrate technologies for improved wing level command and control of logistics assets. <ul style="list-style-type: none"> - (U) Complete initial design requirements for fully integrated wing level logistics information system. - (U) Preliminary demonstrations of integrated information/display technologies to improve command/control of asset distribution. - (U) \$8,677 Total 		
Project 2745	Page 4 of 6 Pages	Exhibit R-3 (PE 0603106F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603106F Logistics Systems Technology	PROJECT 2745
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	17,467	15,338	17,775	Cont
(U) Appropriated Value	18,254	15,338		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-383	-502		
b. SBIR	-404	-334		
c. Omnibus/Other Above Threshold Reprogrammings	-379			
d. Below Threshold Reprogrammings				
e. Rescissions	-29			
(U) Adjustments to Budget Year Since FY 1998 PB			-9,098	
(U) Current Budget Submit/FY 1999 PB	17,059	14,502	8,677	Cont

(U) Change Summary Explanation:

Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603106F Logistics Systems Technology	2745
<p>(U) C. <u>Other Program Funding Summary:</u> Not Applicable.</p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none">- (U) PE 0207219F, Advanced Tactical Fighter.- (U) PE 0602201F, Aerospace Flight Dynamics.- (U) PE 0602202F, Armstrong Lab Exploratory Development.- (U) PE 0603721N, Integrated Diagnostic System.- (U) PE 0604708F, Generic Integrated Maintenance Diagnostics Systems.- (U) PE 0604740F, Computer Resource Management Technology.- (U) PE 0605801A, Pollution Prevention Research and Development.- (U) PE 0708011F, Manufacturing Technology.- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>		
Project 2745	Page 6 of 6 Pages	Exhibit R-3 (PE 0603106F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603108F Integrated Data Systems (IDS)	PROJECT 4427
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4427 Integrated Maintenance Data Systems (IMDS)	0*	18,541	0*	0*	0*	0*	0*	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* FY 97 and FY 99 and outyear funding resides within PE 0708611F, Project 4654. Following FY 98, all funds for IMDS reside within PE 0708611F. All backup and justification material associated with this program is located within that PE.

(U) A. Mission Description and Budget Item Justification

The IMDS program is an evolutionary acquisition program to develop and field an AF standard maintenance information system. This program element integrates information systems supporting Air Force maintenance activities into a single open architecture, modern decision support system. This enhanced decision support system will increase operational production capability and support system efficiency, while decreasing mobility infrastructure requirements and cost of operations. The IMDS System will be integrated with the Combat Support Information System (CSIS) being developed by the Global Combat Support System – Air Force (GCSS-AF) Program. IMDS integrates multiple and diverse maintenance Management Information Systems into a single open system client/server network. IMDS will provide a single virtual data repository for access by all Air Force command levels. Full IMDS capability is reached through six increments of the application software, each increment building on the previous one. The first increment entered test at Eglin AFB July 97 after one year of development. The second increment will enter test in Summer 98 with delivery starting to the field in 2nd Quarter FY98. Increments 1&2 establish core capabilities at the retail level. Increment 3 starts wholesale level functionality as well as continued expansion of retail capabilities. This program is Budget Activity 7, Operational System Development, because projects are being engineered to support already operational weapon systems.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997 (\$ in Thousands):

– (U) \$0 Funding resides within PE 0708611F. See description for PE 0708611F, Project 4654

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998																																																												
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603108F Integrated Data Systems (IDS)	PROJECT 4427																																																													
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) IMDS system contract - (U) \$13,511 Increment 2 - (U) \$788 Increment 3 - (U) Operations - (U) 2,459 Support Contractors - (U) 1,783 SPO Operations - (U) \$18,541 Total <p>(U) <u>FY 1999 (\$ in Thousands) (funding resides within PE 0708611F, project 4654):</u></p> <ul style="list-style-type: none"> - (U) \$0 Funding resides within PE 0708611F. See description for PE 0708611F, Project 4654 <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997*</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999*</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget FY 1998 PB</td> <td style="text-align: center;">17,332</td> <td style="text-align: center;">19,753</td> <td style="text-align: center;">19,706</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">18,232</td> <td style="text-align: center;">19,753</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Congressional/General Reductions</td> <td style="text-align: center;">-456</td> <td style="text-align: center;">-760</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: center;">-444</td> <td style="text-align: center;">-452</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold</td> <td style="text-align: center;">-17,332</td> <td></td> <td style="text-align: center;">-</td> <td></td> </tr> <tr> <td> Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-19,706</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">0</td> <td style="text-align: center;">18,541</td> <td style="text-align: center;">0</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>* </p>					<u>FY 1997*</u>	<u>FY 1998</u>	<u>FY 1999*</u>	<u>Total Cost</u>	(U) Previous President's Budget FY 1998 PB	17,332	19,753	19,706	Continuing	(U) Appropriated Value	18,232	19,753			(U) Adjustments to Appropriated Value					a. Congressional/General Reductions	-456	-760			b. SBIR	-444	-452			c. Omnibus or Other Above Threshold	-17,332		-		Reprogramming					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB			-19,706		(U) Current Budget Submit/FY 1999 President's Budget	0	18,541	0	Continuing
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Project 4427	Page 2 of 3 Pages	Exhibit R-2 (PE 0603108F)																																																													

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603108F Integrated Data Systems (IDS)	PROJECT 4427
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(U) Change Summary Explanation:

Funding: * FY 97 and FY 99 and outyear funding now resides within PE 0708611F, Project 4654. The FY 98 budget was not transferred to PE 0708611F. Instead, FY 98 funds will be executed in PE 0603108F to avoid programmatic impacts and potential accounting problems that may result from reclassification. Following FY 98, all funds for IMDS reside within PE 0708611F.

Schedule: OT&E delayed one year due to funding cuts and Quadrennial Defense Review (QDR) impacts to beta sites and requirements changes.

Technical: Not applicable.

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement AF, BA 7, P-1:55, IMDS (PE 0708611F)		2,800	2,751	2,721	2,686	2,688	2,648	Cont	Cont
(U) O&M (IMDS) (PE 0708611F)		886	949	1,879	1,855	1,891	1,926	Cont	Cont
<u>Related RDT&E:</u>									
(U) PE 0708611F, Project 4654, Integrated Maintenance Data System (IMDS)*	17,222	0	19,317	20,021	25,278	26,132	25,055	Cont	Cont

(U) D. Schedule Profile

See description for PE 0708611F, Project 4654.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	23,524	26,503	21,006	22,629	22,792	22,862	23,463	Continuing	Continuing
2100 Laser Hardened Materials	9,033	9,546	10,994	11,803	11,882	11,915	12,211	Continuing	Continuing
3153 Non-Destructive Inspection Development	7,515	6,575	4,507	4,839	4,872	4,886	5,009	Continuing	Continuing
3946 Materials Transition	6,976	10,382	5,505	5,987	6,038	6,061	6,243	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program demonstrates materials technology options for application into Air Force weapon systems. Developing materials technologies for the broadband laser protection of aircrews and sensors from a variety of threats is a high priority of the Air Force. The Non-Destructive Inspection/Evaluation (NDI/E) techniques for fighter, bomber, and transport aircraft are critical to the logistics centers as well as the operational fleet as the service lives of these systems increase. This program provides critical data for prospective users to make engineering decisions on both structural and non-structural materials for air and space. Reducing risk in materials technology improves the affordability, supportability, reliability, survivability, and operational performance of current and future warfighting systems. Note: For FY 1998, Congress added \$2.5 million for metal fatigue sensing technology and \$5.0 million for infrared signature suppression materials which explains the perceived decrease in FY 1999. In FYs 1998 and out, additional emphasis has been placed on improved materials and sustainment of aging aircraft.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development		PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	25,136	20,596	21,429	Cont
(U) Appropriated Value	26,303	28,096		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-557	-952		
b. SBIR	-610	-641		
c. Omnibus/Other Above Threshold Reprogrammings	-70			
d. Below Threshold Reprogrammings	-1,500			
e. Rescissions	-42			
(U) Adjustments to Budget Year Since FY 1998 PB			-423	
(U) Current Budget Submit/FY 1999 PB	23,524	26,503	21,006	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems				PROJECT 2100		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2100	Laser Hardened Materials	9,033	9,546	10,994	11,803	11,882	11,915	12,211	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: This project develops new materials and concepts for protecting Air Force assets such as aircrews, munitions, sensors, and structures against laser radiation. The goal is to ensure mission capability before, during, and after laser exposure. The world laser market is rapidly expanding with easy export to any nation. Survivability solutions must account for a variety of lasers facing a mission. Current protection schemes are activated by intensity or color and are only capable of countering a specific portion of the laser threat. To harden systems against all potential lasers, a combination of approaches is required. Concepts are demonstrated to provide hardening options for transition to Air Force systems.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,363 Developed advanced materials technologies that enhance laser hardening for Air Force aircraft structures. <ul style="list-style-type: none"> - (U) Completed evaluation of structural materials laser susceptibility under various mission profiles. - (U) Fabricated sub-scale canopy for demonstration of canopy laser protection technologies. - (U) \$3,930 Developed advanced materials technologies that enhance laser hardening for Air Force aircrews. <ul style="list-style-type: none"> - (U) Evaluated demonstrated laser hardening approaches for application in helmet-mounted displays. - (U) Investigated the use of advanced protection coatings in night vision goggles. - (U) \$3,740 Developed advanced materials technologies that enhance laser hardening for sensors, avionics, and components. <ul style="list-style-type: none"> - (U) Completed hardened forward looking infrared (FLIR) system demonstration. - (U) Developed technologies to protect low light level television systems. - (U) \$9,033 Total 										
Project 2100		Page 3 of 11 Pages				Exhibit R-2 (PE 0603112F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems	PROJECT 2100
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<p>– (U) \$1,400</p>	<p>Develop advanced materials technologies that enhance laser hardening for Air Force aircraft structures.</p> <ul style="list-style-type: none"> – (U) Develop high-power mid-wave infrared laser evaluation technologies for simulating continuous and pulsed wave threats. – (U) Develop improved durability topcoats for externally applied laser protection coatings on canopies and aircrew visors. 	
<p>– (U) \$4,098</p>	<p>Develop advanced materials technologies that enhance laser hardening for Air Force aircrews.</p> <ul style="list-style-type: none"> – (U) Demonstrate wrap-around holographic spectacles for multi-band laser protection. – (U) Demonstrate fixed wavelength filter protection technology for night vision goggles. 	
<p>– (U) \$4,048</p>	<p>Develop advanced materials technologies that enhance laser hardening for sensors, avionics, and components.</p> <ul style="list-style-type: none"> – (U) Demonstrate intrinsically hard infrared detector materials technology for advanced electro-optical sensors. – (U) Demonstrate hardened retrofit modules for forward looking infrared (FLIR) sensors. 	
<p>– (U) \$9,546</p>	<p>Total</p>	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p>		
<p>– (U) \$1,617</p>	<p>Develop advanced materials technologies that enhance laser hardening for Air Force aircraft structures.</p> <ul style="list-style-type: none"> – (U) Investigate susceptibility of structural components of Unmanned Aerial Vehicles (UAVs) and high value munitions to medium power lasers. – (U) Continue development of environmentally durable topcoats for canopy and aircrew visor protective coating techniques. 	
<p>– (U) \$4,717</p>	<p>Develop advanced materials technologies that enhance laser hardening for Air Force aircrews.</p> <ul style="list-style-type: none"> – (U) Demonstrate tristimulus spectacles for interim agile (broad band) laser eye protection. – (U) Demonstrate narrow notch, angle insensitive rugate coatings for night vision goggle laser protection. 	
<p>– (U) \$4,660</p>	<p>Develop advanced materials technologies that enhance laser hardening for sensors, avionics, and components.</p> <ul style="list-style-type: none"> – (U) Investigate broad-spectrum limiters for protection of multicolor infrared focal plan array (FPA) detectors. – (U) Demonstrate optical limiter technologies for high value seekers and munitions. 	
<p>– (U) \$10,994</p>	<p>Total</p>	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems	PROJECT 2100																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">9,419</td> <td style="text-align: center;">10,133</td> <td style="text-align: center;">11,215</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">9,033</td> <td style="text-align: center;">9,546</td> <td style="text-align: center;">10,994</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602102F, Materials. - (U) PE 0602202F, Human Systems Technology. - (U) PE 0603231F, Crew Systems and Personnel Protection Technology. - (U) PE 0604706F, Life Support System. - (U) Coordinated through the Tri-Service Laser Hardening Materials and Structures Working Group and the Joint Service Agile Laser Eye Protection Program. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY 1998 PB)	9,419	10,133	11,215	Cont	(U) Current Budget Submit/FY 1999 PB	9,033	9,546	10,994	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>														
(U) Previous President's Budget (FY 1998 PB)	9,419	10,133	11,215	Cont														
(U) Current Budget Submit/FY 1999 PB	9,033	9,546	10,994	Cont														
Project 2100	Page 5 of 11 Pages	Exhibit R-2 (PE 0603112F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems				PROJECT 3153		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
3153 Non-Destructive Inspection Development	7,515	6,575	4,507	4,839	4,872	4,886	5,009	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Develops and demonstrates advanced Non-Destructive Inspection/Evaluation (NDI/E) methods and procedures to monitor performance integrity and to detect failure causing conditions in weapon systems components and materials. NDI/E capabilities greatly influence and/or limit many designs, manufacturing, and maintenance practices. Reduction in the number of fighter wings and the need for rapid sortie generation demand an ability to perform real-time NDI/Es faster than current capability. This project provides technology to satisfy critical Air Force requirements to extend lifetimes of current systems through increased reliability and cost-effectiveness at field and depot maintenance levels, as well as assuring manufacturing quality, integrity, and safety requirements.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5,906 Develop advanced technologies for improved capabilities in materials corrosion and fatigue monitoring and testing of aging aircraft. <ul style="list-style-type: none"> - (U) Continued to develop corrosion detection systems for passive detection of aircraft structural corrosion. - (U) Developed technologies for the inspection of turbine engine components. - (U) Developed software to facilitate combined expert data analysis of various NDI/E inspection techniques (data fusion) to improve inspection throughput and reliability. - (U) Assessed x-ray radioscropy inspection/evaluation techniques for complex structures on aging aircraft. - (U) \$644 Develop advanced inspection technologies supporting fielded and emerging aerospace systems. <ul style="list-style-type: none"> - (U) Assessed inspection/evaluation techniques for stealth aircraft structures. - (U) Assessed Air Force needs for NDI/E techniques as applied to space and space launch systems. - (U) \$965 Develop advanced technologies for improved NDI/E capabilities in materials testing, monitoring, inspection and maintenance. <ul style="list-style-type: none"> - (U) Developed remote inspection microwave non-destructive evaluation techniques for aircraft structures. - (U) Assessed technologies for laser-based ultrasonic detection of hidden flaws in complex aircraft structures. - (U) Evaluated the use of computed tomography for failure analysis of complex structures. - (U) \$7,515 Total 										
Project 3153			Page 6 of 11 Pages			Exhibit R-2 (PE 0603112F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems	PROJECT 3153
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5,560 Develop advanced technologies for improved capabilities in materials corrosion and fatigue monitoring and testing of aging aircraft. <ul style="list-style-type: none"> - (U) Investigate emerging approaches to the detection of hidden corrosion. - (U) Continue development technologies for the inspection of turbine engine components. - (U) Demonstrate data fusion software for expert data analysis on select weapon system(s) applications. - (U) Develop x-ray radioscopy inspection/evaluation techniques for complex structures on aging aircraft. - (U) \$175 Develop advanced inspection technologies supporting fielded and emerging aerospace systems. <ul style="list-style-type: none"> - (U) Initiate advanced development of NDE/I technology opportunities for application to space and space launch systems. - (U) \$840 Develop advanced technologies for improved NDI/E capabilities in materials testing, monitoring, inspection, and maintenance. <ul style="list-style-type: none"> - (U) Develop technologies for laser-based ultrasonic detection of hidden flaws in complex aircraft structures. - (U) \$6,575 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> -(U) \$3,039 Develop advanced technologies for improved capabilities in materials corrosion and fatigue monitoring and testing of aging aircraft. <ul style="list-style-type: none"> - (U) Develop emerging approaches to the detection of hidden corrosion. - (U) Demonstrate advanced NDI/E techniques for the inspection of turbine engine components. - (U) Optimize x-ray radioscopy inspection/evaluation techniques for complex structures on aging aircraft. - (U) \$612 Develop advanced inspection technologies supporting fielded and emerging aerospace systems. <ul style="list-style-type: none"> - (U) Complete development of NDE/I technology opportunities for application to space and space launch systems. - (U) Develop multiple advanced NDI/E technologies for the inspection of stealth aircraft systems and components. - (U) Integrate NDE results into ballistic performance models for rapid assessment of rocket motor propellant service life. - (U) \$856 Develop advanced technologies for improved NDI/E capabilities in materials testing, monitoring, inspection and maintenance. <ul style="list-style-type: none"> - (U) Demonstrate technologies for laser-based ultrasonic detection of hidden flaws in complex aircraft structures. - (U) \$4,507 Total 		
Project 3153	Page 7 of 11 Pages	Exhibit R-2 (PE 0603112F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems	PROJECT 3153																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">7,778</td> <td style="text-align: center;">4,472</td> <td style="text-align: center;">4,598</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">7,515</td> <td style="text-align: center;">6,575</td> <td style="text-align: center;">4,507</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602102F, Materials. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	7,778	4,472	4,598	Cont	(U) Current Budget Submit/FY 1999 PB	7,515	6,575	4,507	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	7,778	4,472	4,598	Cont														
(U) Current Budget Submit/FY 1999 PB	7,515	6,575	4,507	Cont														
Project 3153	Page 8 of 11 Pages	Exhibit R-2 (PE 0603112F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems				PROJECT 3946		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
3946 Materials Transition	6,976	10,382	5,505	5,987	6,038	6,061	6,243	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Develops data to accelerate the time to scale-up new defense-related materials and achieve their acceptance by designers. The goal is to reduce risk, improve confidence, and reduce cost of the incorporation of new materials into weapons, airframes, engine, and space applications. Advanced materials and related processes that have matured beyond exploratory development are characterized and critical data is developed to reduce the risk of demonstrating these technologies in Air Force applications. Critical evaluations of materials in the proposed design environment are performed. This design and scale-up data provides confidence to transition new materials to upgrades and future Air Force systems as well as provide the initial incentive for their industrial development.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,016 Developed defense-related materials technologies and data bases to facilitate timely transition of advanced structures, propulsion, and subsystems materials to warfighters, industry, and academia. <ul style="list-style-type: none"> - (U) Scaled-up and evaluated improved infrared signature reduction coatings for aircraft. - (U) Continued development of new wrought gamma titanium processes for application in advanced turbine engines. - (U) \$2,725 Developed technologies and data bases to facilitate timely transition of advanced electronics, optics, and survivability materials to warfighters, industry, and academia. <ul style="list-style-type: none"> - (U) Completed demonstration of durable infrared window materials and coatings for high temperature and debris environments. - (U) Developed thermal control coatings for space applications. - (U) \$565 Developed technologies and data bases to facilitate timely transition of advanced materials for improved systems support and operational support to warfighters, industry, and academia. <ul style="list-style-type: none"> - (U) Continued to characterize the physical properties of advanced structural materials and provide design allowable data to designers. - (U) Continued to evaluate improved materials and materials processes for potential use in aircraft systems. - (U) \$1,670 Developed and demonstrated engineering design trade off methods to allow designers and users to assess affordability versus performance, support cost, risk, etc. in early development. - (U) \$6,976 Total 										
Project 3946			<i>Page 9 of 11 Pages</i>			Exhibit R-2 (PE 0603112F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems	PROJECT 3946
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,017 Develop technologies and data bases to facilitate timely transition of advanced structures, propulsion, and subsystems materials to warfighters, industry, and academia. <ul style="list-style-type: none"> - (U) Demonstrate lightweight structural composite materials for spacecraft radiators and thermal control components. - (U) Demonstrate processing techniques for net shape, low-cost titanium turbine engine components. - (U) \$2,945 Develop technologies and data bases to facilitate timely transition of advanced electronics, optics, and survivability materials to warfighters, industry, and academia. <ul style="list-style-type: none"> - (U) Scale-up processing techniques for advanced two-color, infrared suppression coatings and treatment for advanced aircraft. - (U) Demonstrate a tough, durable, affordable window for infrared imaging sensors for advanced aircraft. - (U) \$420 Develop technologies and data bases to facilitate timely transition of advanced materials for improved systems support and operational support to warfighters, industry, and academia. <ul style="list-style-type: none"> - (U) Continue to characterize the physical properties of advanced structural materials and provide design data to designers. - (U) Continue to evaluate improved materials and materials processes for potential use in aircraft systems. - (U) \$10,382 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,232 Develop technologies and data bases to facilitate timely transition of advanced structures, propulsion, and subsystems materials to warfighters, industry, and academia. <ul style="list-style-type: none"> - (U) Demonstrate thermal control coatings on advanced, high thermal conductivity composites for spacecraft thermal control. - (U) Demonstrate low-cost, wrought titanium aluminide alloys and processing techniques for advanced turbine engines. - (U) \$2,858 Develop technologies and data bases to facilitate timely transition of advanced materials for high power radars, space-based sensors, and infrared countermeasures to warfighters, industry, and academia. <ul style="list-style-type: none"> - (U) Demonstrate zinc germanium phosphide (ZnGeP) as a tunable laser source for advanced infrared countermeasures. - (U) Demonstrate advanced processing techniques for the growth of mercury cadmium telluride infrared detector materials for advanced space-based sensor systems. - (U) \$415 Develop technologies and data bases to facilitate timely transition of advanced materials for improved systems support and operational support to warfighters, industry, and academia. <ul style="list-style-type: none"> - (U) Continue to characterize the physical properties of advanced structural materials and provide design data to designers. - (U) Continue to evaluate improved materials and materials processes for potential use in aircraft systems. - (U) \$5,505 Total 		
Project 3946	Page 10 of 11 Pages	Exhibit R-2 (PE 0603112F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems	PROJECT 3946																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 35%;"></th> <th style="width: 15%; text-align: center;"><u>FY 1997</u></th> <th style="width: 15%; text-align: center;"><u>FY 1998</u></th> <th style="width: 15%; text-align: center;"><u>FY 1999</u></th> <th style="width: 20%; text-align: center;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">7,939</td> <td style="text-align: center;">5,991</td> <td style="text-align: center;">5,616</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">6,976</td> <td style="text-align: center;">10,382</td> <td style="text-align: center;">5,505</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program. Schedule: Not Applicable. Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602102F, Materials. - (U) PE 0603211F, Aerospace Structures. - (U) PE 0603202F, Aerospace Propulsion Subsystem Integration. - (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles. - (U) PE 0603216F, Aerospace Propulsion and Power Technology. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	7,939	5,991	5,616	Cont	(U) Current Budget Submit/FY 1999 PB	6,976	10,382	5,505	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	7,939	5,991	5,616	Cont														
(U) Current Budget Submit/FY 1999 PB	6,976	10,382	5,505	Cont														
Project 3946	Page 11 of 11 Pages	Exhibit R-2 (PE 0603112F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603202F Aerospace Propulsion Subsystem Integration	PROJECT 668A
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
668A Aircraft Propulsion Subsystem Integration	23,919	23,378	30,814	31,616	32,620	31,494	33,214	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** This Advanced Technology Development program develops and demonstrates gas turbine propulsion system technologies applicable to a broad range of aircraft. The Aircraft Propulsion Subsystem Integration (APSI) program includes demonstrator engines such as the Joint Technology Demonstrator Engine (JTDE) for manned systems and the Joint Expendable Turbine Engine Concept (JETEC) for uninhabited air vehicle and cruise missile applications. These demonstrator engines apply the core technology developed under the Advanced Turbine Engine Gas Generator (ATEGG) program coupled with affordable and durable system component technology such as low pressure fans and low pressure turbines (LPT), engine controls, and nozzles developed as part of APSI. This program also focuses on system integration aspects of inlets, nozzles, engine/airframe compatibility, and low-observable technologies. APSI will provide aircraft with potential for longer range and higher cruise speed with lower specific fuel consumption; surge power for successful engagements; high sortie rates with reduced maintenance; reduced life cycle cost; and improved survivability resulting in increased mission effectiveness. The APSI program supports the demonstration of performance, cost, and durability goals of the Integrated High Performance Turbine Engine Technology (IHPTET) program. IHPTET is a three phase, totally integrated DOD, DARPA, NASA, and industry initiative focused on doubling turbine engine propulsion capabilities while reducing cost of ownership. The IHPTET program structure provides continuous technology transition for military turbine engine upgrades and derivatives and has the added benefit of enhancing the U.S. turbine engine industry's international competitiveness.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603202F Aerospace Propulsion Subsystem Integration	PROJECT 668A
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,940 Designed, fabricated, and demonstrated fans, low pressure turbines, engine controls, exhaust nozzles, and integration technology for turbofan/turbojet engines for current and future Air Force aircraft. <ul style="list-style-type: none"> - (U) Completed fabrication and demonstrated distributed and model-based engine controls. - (U) Demonstrated ceramic composite components for exhaust nozzles. - (U) \$16,142 Designed, fabricated, and tested technology demonstration engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. <ul style="list-style-type: none"> - (U) Completed fabrication and demonstrated forward swept fan technology. - (U) Completed fabrication and demonstrated Castcool and Internal Convective Enhancement (ICE) turbines. - (U) Completed fabrication and demonstrated integration technologies including metal matrix composite shafts, hybrid ceramic bearings, and counterrotating vaneless turbine. - (U) Completed fabrication and demonstrated variable cycle engine with fixed geometry, fluidic area control, and fluidic thrust vectoring exhaust technologies. - (U) \$3,837 Designed, fabricated, and tested technology demonstration engines for expendable engines for missile applications. <ul style="list-style-type: none"> - (U) Demonstrated high pressure ratio, forward swept compressor stage. - (U) Demonstrated efficient, lightweight lamilloy hot section with first use of high temperature capable MA754 sheet material. - (U) Demonstrated low-cost, uncooled ceramic hot section. - (U) \$23,919 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,937 Design, fabricate, and demonstrate durability and integration technologies for turbofan/turbojet engines for current and future Air Force aircraft. <ul style="list-style-type: none"> - (U) Complete fabrication of model-based, distributed and active stability engine controls. - (U) Complete fabrication of integration technologies including metal matrix composite shafts, hybrid ceramic bearings, and counterrotating vaneless turbine - (U) Apply laser shot peening to increase durability of turbine engine components. - (U) \$14,359 Design and fabricate technology demonstration turbofan/turbojet engines for fighters, attack aircraft, bombers, and transports. <ul style="list-style-type: none"> - (U) Complete fabrication of advanced lightweight, high strength materials for turbine engine components. - (U) Complete fabrication of variable cycle engine with a swirl augmentor and fixed geometry thermal and fluidic area control exhaust nozzle. 		
Project 668A	Page 2 of 4 Pages	Exhibit R-2 (PE 0603202F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603202F Aerospace Propulsion Subsystem Integration	PROJECT 668A
<ul style="list-style-type: none"> - (U) \$4,082 - (U) \$23,378 	<ul style="list-style-type: none"> Design, fabricate, and test technology demonstration engines for missile and uninhabited air vehicle applications. <ul style="list-style-type: none"> - (U) Design high temperature shrouded compressor. - (U) Design low-cost ceramic matrix composite (CMC) combustor. - (U) Design low-cost, high efficiency, uncooled carbon-carbon turbine. - (U) Design rich burn nozzle and controls for thrust augmentation. - (U) Design advanced engine components to increase affordability and high temperature operation with reduced cooling requirements. Total 	
(U) <u>FY 1999 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$4,148 - (U) \$10,136 - (U) \$11,306 - (U) \$5,224 - (U) \$30,814 	<ul style="list-style-type: none"> Design, fabricate, and demonstrate controls technology for turbofan/turbojet engines for current and future Air Force aircraft. <ul style="list-style-type: none"> - (U) Demonstrate model-based, distributed and active stability engine controls. - (U) Conduct preliminary design for fully distributed and active stability engine controls. - (U) Design integral starter/generator. Design, fabricate, and demonstrate durability and integration technology for turbofan/turbojet engines for current and future Air Force aircraft. <ul style="list-style-type: none"> - (U) Demonstrate laser shot peening to increase durability of turbine engine components. - (U) Demonstrate integration technologies including metal matrix composite shafts, hybrid ceramic bearings, and counterrotating vaneless turbine - (U) Conduct preliminary design of more affordable integration technologies including composite hot section components, advanced fan, and low-observable exhaust nozzles. Design, fabricate, and test technology demonstration engines for turbofan/turbojet engines for fighters, aircraft, bombers, and transports. <ul style="list-style-type: none"> - (U) Demonstrate variable cycle engine with a swirl augmentor and fixed geometry thermal and fluidic area control exhaust nozzle. - (U) Design, fabricate, and demonstrate advanced hot section cooling system. Design, fabricate, and test technology demonstration engines for missile and uninhabited air vehicle applications. <ul style="list-style-type: none"> - (U) Fabricate high temperature shrouded compressor. - (U) Fabricate low-cost CMC combustor. - (U) Fabricate low-cost, high efficiency, uncooled carbon-carbon turbine. - (U) Fabricate rich burn nozzle and controls for thrust augmentation. - (U) Fabricate advanced engine components that are more affordable and capable of high temperature operation with reduced cooling requirements. Total 	
Project 668A	Page 3 of 4 Pages	Exhibit R-2 (PE 0603202F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603202F Aerospace Propulsion Subsystem Integration			PROJECT 668A
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	27,031	30,564	31,434	Cont
(U) Appropriated Value	28,318	24,785		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-594	-810		
b. SBIR	-693	-597		
c. Omnibus/Other Above Threshold Reprogrammings	-72			
d. Below Threshold Reprogrammings	-3,000			
e. Rescissions	-40			
(U) Adjustments to Budget Years Since FY 1998 PB			-620	
(U) Current Budget Submit/FY 1999 PB	23,919	23,378	30,814	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
- (U) PE 0602203F, Aerospace Propulsion.				
- (U) PE 0603112F, Advanced Materials for Weapon Systems.				
- (U) PE 0603216F, Aerospace Propulsion and Power Technology.				
- (U) PE 0602122N, Aircraft Technology.				
- (U) PE 0603217N, Air Systems Advanced Technology Demonstration.				
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
Project 668A Page 4 of 4 Pages Exhibit R-2 (PE 0603202F)				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	28,240	25,077	26,442	25,148	26,269	26,499	27,309	Continuing	Continuing
665A Airborne Sensors Technology	12,307	11,707	11,332	10,502	10,853	11,076	11,344	Continuing	Continuing
69CK Advanced Electronics	3,273	1,450	1,568	1,071	1,234	1,246	1,442	Continuing	Continuing
69DF Target Attack and Recognition Technology	12,660	11,920	13,542	13,575	14,182	14,177	14,523	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program develops technology to enable continued avionics superiority. Combat aircraft must defeat increasingly sophisticated active and passive countermeasures, destroy a wide variety of targets with precision, and reliably perform complex missions with less logistics support in a world of proliferating threats. This program responds to these needs by developing and demonstrating aerospace platform technologies and techniques for advanced radio frequency sensors (i.e., radar) and electro-optical sensors for air and ground targeting including: electronic counter-countermeasures; advanced electronics technologies for improvements in cost, weight, and reliability; fire control/weapon delivery; target identification and recognition technologies; and techniques for precision air and ground target identification. Emphasis is on detecting, locating, and targeting airborne, fixed, and time-critical mobile ground targets while providing the capability to adapt to changes in target signatures and background environments. These advanced avionics capabilities will provide for flexible, multi-function/multi-mission combat aircraft that can: safely penetrate threat areas; destroy multiple ground targets per pass; accurately detect and identify targets beyond-visual-range within a complex mix of look-alike friendly, neutral, and enemy aircraft; win aerial engagements; and return to fight again.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development		PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
(U) Previous President's Budget (FY 1998 PB)	27,475	26,507	28,206	Cost
(U) Appropriated Value	28,691	26,507		Cont
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-611	-879		
b. SBIR	-605	-551		
c. Omnibus/Other Above Threshold Reprogrammings	-190			
d. Below Threshold Reprogrammings	1,000			
e. Rescissions	-45			
(U) Adjustments to Budget Year Since FY1998 PB			-1,764	
(U) Current Budget Submit/FY 1999 PB	28,240	25,077	26,442	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due higher priorities within the Science and Technology (S&T) Program. Below Threshold Reprogramming is for a Digital Enhancement Program for tactical airborne radars.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles				PROJECT 665A		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
665A Airborne Sensors Technology	12,307	11,707	11,332	10,502	10,853	11,076	11,344	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Develops and demonstrates aerospace platform sensor technologies, including electro-optical sensors, radars, and electronic counter-countermeasures (ECCM) for radars. This project provides the warfighter with the capability to precisely detect and target both airborne targets (conventional and low radar cross section) and ground-based, high-value, time-critical targets. Work includes developing both complete sensor capabilities as well as advanced component technologies. The desired warfighting capability includes the ability to detect and target in difficult background conditions, with emphasis on countering improvements in camouflage, concealment, and deception techniques that limit current detection and tracking capability for threats obscured by these means.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$218 Develop affordable multi-function electro-optical sensor technology for long-range target detection and track/missile warning. This effort will combine the offensive and defensive functions into a single electro-optical sensor, reducing volume and cost of the overall system. <ul style="list-style-type: none"> - (U) Defined multi-function sensor technologies for an integrated offensive and defensive sensor system. - (U) \$873 Develop airborne, air-to-ground, wind profiling technologies to enhance first shot hit capability of gunships and for greater precision air drops from cargo aircraft. This technology will decrease loiter time and increase operational altitude, thus, improving survivability. <ul style="list-style-type: none"> - (U) Completed evaluation and transitioned wind profiling system in cooperation with Warner Robins Air Logistics Command. - (U) Investigated technology issues related to improving cargo drop performance on transport aircraft. - (U) \$873 Develop and demonstrate, through a tri-Service program, the multi-spectral electro-optical sensor and algorithm technology required to passively search large areas, detect, and target ground-based targets in the open and under cover. Passive search allows the user to remain covert. <ul style="list-style-type: none"> - (U) Verified multi-spectral targeting sensor performance using tower data for joint United Kingdom/France/U.S. Air Force/U.S. Navy advanced fire control development program. 										
Project 665A			Page 3 of 15 Pages			Exhibit R-2 (PE 0603203F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles	
		PROJECT 665A
– (U) \$2,255	Develop, demonstrate, and evaluate advanced laser technologies that provide pilots with positive, timely, and reliable identification information that is compatible with existing reliable identification/identify friend or foe techniques. This technology will be packaged for existing electro-optical systems and provide the capability for air-to-air missile launch at 60 km and air-to-ground weapon launch at 15-25 km. – (U) Demonstrated three-dimensional imaging capability in a field test. – (U) Evaluated synthetic aperture radar ECCM techniques that allow all-weather targeting of high-value ground targets while under severe jamming. – (U) Performed laboratory and roofhouse demonstrations of electronic protection techniques for transition to front-line fighters and bombers operating in harsh electronic countermeasure environments.	
– (U) \$2,684	Develop adaptive processing techniques to negate clutter and electromagnetic interference, both intentional and unintentional, for uninterrupted sensor performance and increased detection and targeting performance against sophisticated and low radar cross section targets. – (U) Continued to develop innovative concepts to eliminate clutter and interference from other sensors on board and enable the maximum possible target detection and tracking range. – (U) Used airborne radar data to perform cost/performance trade studies of advanced clutter/interference mitigation techniques.	
– (U) \$1,932	Develop and demonstrate, through an Air Force/Navy/Defense Advanced Research Projects Agency program, the radio frequency sensor and algorithm technology required to detect, identify, and target high-value, time-critical targets obscured by foliage or concealed through deceptive techniques. – (U) Performed ground demonstration of real-time, automatic detection of concealed/camouflaged, high-value, time-critical targets. – (U) Developed sensor specification for an airborne, all-weather, concealed target detection sensor.	
– (U) \$1,769	Develop critical components required to lower life cycle cost of radar apertures for operational and future radar systems. – (U) Fabricated low-cost antenna aperture for improved performance of electronic scanned arrays. – (U) Performed experiments to evaluate aperture technology for performance and reliability under laboratory conditions and harsh operating environments. – (U) Developed radar aperture technology with life cycle cost reduction goal of 20-40%.	
– (U) \$12,307	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles	PROJECT 665A
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$2,430 Develop integrated air-to-air and air-to-ground electro-optical sensor technologies to detect and identify targets at ranges longer than currently achievable, whether the targets are camouflaged, low-observable, or employing other means of deception. This technology will enable warfighters to engage mobile strategic targets. <ul style="list-style-type: none"> – (U) Complete collection of field test data for the design of a day/night multispectral sensor capable of detection of deep hide targets. – (U) Initiate a multi-national program to demonstrate affordable, real-time, air-to-ground and air-to-air precision targeting capability from survivable stand-off ranges (20 km). – (U) \$2,483 Develop airborne, air-to-ground wind profiling technologies to enhance accuracy of bomb drops and cargo delivery. <ul style="list-style-type: none"> – (U) Demonstrate modular wind profiler that shows four to ten times improvement in air drop accuracy from 28,000 feet. – (U) Complete design and begin fabrication of wind sensor system to improve unguided bombing accuracies. – (U) \$1,241 Develop and demonstrate radar electronic counter-countermeasure techniques to negate air intercept and synthetic aperture radar electronic countermeasures. <ul style="list-style-type: none"> – (U) Develop electronic protection techniques against emerging threats, including application of neural nets to identify and remove jamming waveforms, and use real radar imagery to assess improvements. – (U) \$3,103 Develop processing techniques to negate clutter and electromagnetic interference, both intentional and unintentional, for uninterrupted sensor performance and increased detection and targeting performance against sophisticated and low radar cross section targets. <ul style="list-style-type: none"> – (U) Refine advanced, integrated, air-to-air/air-to-ground, clutter/interference techniques to restore high performance radar capabilities in severe jamming and clutter environments. Demonstrate a four times improvement in acquisition range through adaptive processing. – (U) \$1,117 Develop and demonstrate the radio frequency sensor and algorithm technology required to detect, identify, and target high-value, time-critical targets obscured by foliage or concealed through deceptive techniques. <ul style="list-style-type: none"> – (U) Demonstrate, through an Air Force/Army/Defense Advanced Research Projects Agency program, real-time automatic detection algorithms in unmanned aerial vehicle-sized radar hardware in preparation for flight demonstration of all-weather, obscured target detection. – (U) \$1,333 Develop critical components required to lower life cycle cost of current and future radar systems. <ul style="list-style-type: none"> – (U) Perform experiments to evaluate antenna technology for performance and reliability improvements under laboratory conditions. – (U) Conduct flight tests of an advanced air platform antenna for precision weapon delivery. – (U) \$11,707 Total 		
Project 665A	Page 5 of 15 Pages	Exhibit R-2 (PE 0603203F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles	PROJECT 665A
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$2,172 Develop integrated air-to-air and air-to-ground electro-optical (EO) sensor technologies to detect and identify targets at ranges longer than currently achievable, whether the targets are camouflaged, low-observable, or employing other means of deception. This technology will enable warfighters to engage mobile strategic targets. <ul style="list-style-type: none"> – (U) Evaluate integrated EO sensor system components and assess for automatic target recognition capability. – (U) Use field test data to fabricate an airborne EO sensor which can operate in day or night and across multiple optical bands. – (U) Complete design and initiate fabrication of an EO target detection and ID sensor that increases ID range ten-fold. – (U) \$1,482 Develop and demonstrate radar electronic counter-countermeasure techniques to negate air intercept and synthetic aperture radar electronic countermeasures. <ul style="list-style-type: none"> – (U) Continue to develop electronic protection techniques against emerging threats, including application of neural nets to identify and remove jamming waveforms, and use real radar imagery to assess improvements. – (U) \$3,543 Develop processing techniques to negate clutter and electromagnetic interference, both intentional and unintentional, for uninterrupted sensor performance and increased detection and targeting performance against sophisticated and low radar cross section targets. <ul style="list-style-type: none"> – (U) Conduct laboratory/rooftop demonstration of advanced clutter/interference mitigation techniques for restoring high performance air-to-air and air-to-ground radar capabilities in severe jamming and interference environments. – (U) \$3,253 Develop and demonstrate the radio frequency sensor and algorithm technology required to detect, identify, and target high-value, time-critical targets obscured by foliage or concealed through deceptive techniques. <ul style="list-style-type: none"> – (U) Ground test and evaluate real-time image formation/interference mitigation algorithms for all-weather, foliage-penetration synthetic aperture radar. – (U) Ground test and evaluate target detection algorithms for detecting ground targets obscured by foliage and/or camouflage. – (U) \$882 Develop critical components required to lower life cycle cost of current and future radar systems. <ul style="list-style-type: none"> – (U) Conduct flight test of affordable antenna suitable for unmanned aerial vehicles. – (U) Develop dual-use, low-cost radar technology enhancements for application to current frontline fighters. – (U) \$11,332 Total 		
Project 665A	Page 6 of 15 Pages	Exhibit R-2 (PE 0603203F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles	PROJECT 665A																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">11,326</td> <td style="text-align: center;">12,380</td> <td style="text-align: center;">11,314</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">12,307</td> <td style="text-align: center;">11,707</td> <td style="text-align: center;">11,332</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to priorities within the Science and Technology (S&T) Program. Schedule: Not Applicable. Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602204F, Aerospace Avionics. - (U) PE 0603205F, Flight Vehicle Technology. - (U) PE 0603707F, Weather Systems Advanced Development. - (U) PE 062111N, Weapons Technology. - (U) PE 062232N, Space and Electronic Warfare (SEW) Technology. - (U) PE 0604249F, LANTIRN Night Precision Attack. - (U) PE 0603270F, Electronic Combat Technology. - (U) A memorandum of agreement has been established between the Air Force Wright Laboratory and the Defense Advanced Research Projects Agency (DARPA) to jointly develop the technology required to detect high-value, time-critical targets in a variety of environments including deception, camouflage, concealment, and deep hide. This technology also has significant application in the civil sector. DARPA and the Air Force will collaborate with civil agencies where appropriate. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	11,326	12,380	11,314	Cont	(U) Current Budget Submit/FY 1999 PB	12,307	11,707	11,332	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	11,326	12,380	11,314	Cont														
(U) Current Budget Submit/FY 1999 PB	12,307	11,707	11,332	Cont														
Project 665A	Page 7 of 15 Pages	Exhibit R-2 (PE 0603203F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles	PROJECT 69CK
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
69CK Advanced Electronics	3,273	1,450	1,568	1,071	1,234	1,246	1,442	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Develops and demonstrates military specific microelectronic devices, tools, and components that improve performance, reliability, and affordability of radar, communications, and electronic counter-countermeasure systems for both retrofit and new system applications. Results of the work provide the warfighter with increased sensor capabilities in terms of increased situational awareness, higher accuracy detection and tracking of targets/threats at longer ranges, more precise weapon employment, and increased affordability. This project develops electronics technologies unavailable from commercial sources and includes development of: monolithic solid state transmit/receive modules for airborne radar; high-speed analog-to-digital converters; high reliability electronics power distribution; and microwave/microelectronics packaging and interconnect techniques.

(U) FY 1997 (\$ in Thousands):

- (U) \$1,551 Develop advanced microelectronics component, power distribution, packaging, and interconnect technologies to provide for reduction in power consumption, cost, weight, and volume of target detection electronics.
 - (U) Demonstrated reliability of inorganic chip seal process that reduces size and cost of packaging for target detection electronics.
 - (U) Fabricated and tested advanced power modules for improved efficiency and reliability in phased array radar systems.
- (U) \$1,060 Develop advanced component technologies to integrate multi-function microwave and millimeter wave circuits for reduced airborne sensor cost, weight, and volume, and improved reliability of radar and targeting electronics.
 - (U) Demonstrated initial driver and booster amplifier designs; completed final design of low-band microwave power module.
- (U) \$662 Develop advanced multi-function sensor electronics, including integrated analog/digital elements (both radio frequency (RF) and electro-optical), to increase reliability, improve performance, and decrease cost, weight, and volume in integrated airborne avionics.
 - (U) Selected analog/digital microwave receiver designs which offer greatest overall improvement in cost and performance and initiate development.
 - (U) Developed affordable high performance RF device and packaging technologies which minimize the number of components and size of transmit/receive modules for use in phased array multi-function sensors on manned and unmanned platforms.
- (U) \$3,273 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles	PROJECT 69CK
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$545 Develop advanced microelectronics components, power distribution, packaging, and interconnect technologies to reduce power consumption, cost, weight, and volume of emerging military systems such as target detection and tracking electronics. <ul style="list-style-type: none"> - (U) Demonstrate a capability to apply advanced inorganic coatings for the encapsulation of integrated circuits to achieve a ten times reduction in packaging costs while realizing weight savings and performance improvements. - (U) Continue development of advanced power supplies with improved efficiency and reliability needed for both analog and digital components used in multi-function phased array radar systems. - (U) \$557 Develop advanced multi-function sensor electronics, including integrated analog/digital applications, to increase reliability, improve performance, and decrease cost, weight, and volume in integrated airborne avionics. <ul style="list-style-type: none"> - (U) Optimize very high-speed digital assemblies that can replace multiple analog assemblies in fighter aircraft radar applications to reduce system volume, complexity, and life cycle costs. - (U) Continue development of affordable, high performance radio frequency (RF) circuits and packaging technologies for minimum size transmit/receive modules for use in phased array antenna multi-function RF sensors on manned and unmanned platforms. - (U) Demonstrate a miniature analog/digital microwave receiver with improved performance and reduced cost. - (U) \$348 Develop advanced design automation tools and methods for creating complex electronics/avionics. These tools will significantly lower the development cost and subsequent support costs of all electronic systems. <ul style="list-style-type: none"> - (U) Demonstrate the speed of automated design tools by designing an integrated circuit board for fighter cockpit applications. - (U) \$1,450 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,568 Develop advanced multi-function sensor electronics, including integrated analog/digital applications, to increase reliability, improve performance, and decrease cost, weight, and volume in integrated airborne avionics. <ul style="list-style-type: none"> - (U) Continue to develop very high-speed digital assemblies that can replace multiple analog assemblies in applications such as fighter aircraft radars to reduce system volume, complexity, and life cycle costs. - (U) Fabricate and test miniature, high performance RF/digital multichip assemblies to increase jam-resistance of multichannel RF sensor receivers. - (U) Initiate design of miniature, all-digital, microwave receiver components with improved performance and reduced costs. - (U) \$1,568 Total 		
Project 69CK	Page 9 of 15 Pages	Exhibit R-2 (PE 0603203F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles	PROJECT 69CK																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">3,368</td> <td style="text-align: center;">1,532</td> <td style="text-align: center;">3,078</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">3,273</td> <td style="text-align: center;">1,450</td> <td style="text-align: center;">1,568</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program. Schedule: Not Applicable. Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602204F, Aerospace Avionics. - (U) PE 0603270F, Electronic Combat Technology. - (U) PE 0603739E, Electronic Manufacturing Technology. - (U) PE 0603706E, Microwave/Millimeter Wave Integrated Circuits. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	3,368	1,532	3,078	Cont	(U) Current Budget Submit/FY 1999 PB	3,273	1,450	1,568	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	3,368	1,532	3,078	Cont														
(U) Current Budget Submit/FY 1999 PB	3,273	1,450	1,568	Cont														
Project 69CK	Page 10 of 15 Pages	Exhibit R-2 (PE 0603203F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles				PROJECT 69DF		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
69DF Target Attack and Recognition Technology	12,660	11,920	13,542	13,575	14,182	14,177	14,523	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Develops and demonstrates advanced technologies for attack management, fire control, and target identification and recognition capabilities. The objective of this project includes developing and demonstrating integrated fire control techniques to provide for a capability of adverse-weather air-to-surface precision strike against multiple targets-per-pass and air-to-air engagement at maximum weapon launch range with cooperative launch deployment flexibility. Specific fire control technologies include attack management, sensor fusion, automated decision aids, advanced tracking for low radar cross section threats, and targeting using both on-board and off-board sensor information. These fire control developments will provide force multiplication and a reduction of exposure to hostile fire. The objectives of this project also include developing and demonstrating technologies to provide for positive, high confidence cueing, recognition, and identification of both airborne and ground-based, high-value, time-critical targets at ranges compatible with tactical air-to-air and air-to-surface weapons in bad weather, day or night, and in high-threat multiple target battle areas. Model-based vision algorithms and target signature development techniques are key to the identification and recognition solution and are pursued in this project in partnership with the Defense Advanced Research Projects Agency. The techniques developed are evaluated to support the Theater Missile Defense efforts in surveillance and attack. The fire control and recognition technologies developed and demonstrated in this project are high leverage in that they provide for significant advancements in operational capabilities largely through software improvements which can be readily transitioned to new and existing systems.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,882 Develop synthetic signature capability for ground targets to train automatic target recognition algorithms. <ul style="list-style-type: none"> - (U) Demonstrated capability to rapidly insert synthetic signatures of new targets into automatic target recognition sensor algorithms. - (U) Evaluated tactical target models under camouflage and partial obscuration conditions. - (U) \$1,959 Evaluate algorithms, including model-based vision algorithms, for moving and stationary target acquisition and recognition and for theater missile defense surveillance and attack efforts. <ul style="list-style-type: none"> - (U) Demonstrated and evaluated maturity of end-to-end algorithms, including moving and stationary target acquisition, for insertion into theater missile defense demonstration efforts. - (U) \$1,418 Develop advanced hostile target identification technologies to provide a capability for beyond-visual-range, all aspect, high confidence classification and identification of airborne targets. <ul style="list-style-type: none"> - (U) Continued to demonstrate synthetic signature generation capability to support fielded automatic target recognition systems. 										
Project 69DF			Page 11 of 15 Pages				Exhibit R-2 (PE 0603203F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles	PROJECT 69DF
– (U) \$283	Develop advanced air-to-air engagement and weapon delivery technologies to provide for a beyond-visual-range detection, targeting, and weapon deployment capability against sophisticated and reduced observable airborne threats.	
	– (U) Developed cooperative engagement subsystem technology for fighter weapon systems.	
	– (U) Evaluated cooperative engagement and tracking accuracy development for air-to-air weapon deployment through continued simulation and ground-based experiments.	
– (U) \$591	Develop advanced information fusion technologies to increase air engagement situation awareness and lethality through: longer-range, high confidence identification; integration of offensive and defensive sensor technology; and exploitation of off-board targeting information.	
	– (U) Completed ground-to-air testing at the Radar Test Facility of multispectral radar signal fusion techniques.	
	– (U) Integrated multispectral radar signal fusion into airborne data collection system.	
	– (U) Collected airborne data and analyzed multispectral radar signature fusion technologies.	
– (U) \$2,658	Develop advanced tracking algorithms to increase detection range of conventional threats and maintain detection range against low cross section threats. This effort will also increase identification range of airborne threats.	
	– (U) Continued to collect airborne data to evaluate the increase in identification range provided by advanced tracking algorithms versus existing tracking systems.	
– (U) \$2,869	Develop technologies for targeting both stationary and moving ground-based threats with precision, utilizing both on-board and off-board targeting information. These technologies provide the targeting solution required to release air-to-surface weapons.	
	– (U) Completed performance evaluation of advanced targeting techniques using real-time, off-board information.	
	– (U) Completed analysis of off-board targeting concepts and provide option to transition to operational aircraft.	
– (U) \$12,660	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$3,688	Develop and demonstrate advanced air-to-air detection, tracking, identification, and engagement technologies to provide beyond-visual-range, all-aspect, high confidence classification, identification, targeting, and all-aspect weapon deployment against conventional and reduced-signature airborne threats.	
	– (U) Complete development and transition of turnkey synthetic signature generation capability to support hostile airborne target identification program.	
	– (U) Investigate the use of advanced sensor suites and off-board sources for long-range, high-confidence identification of airborne targets.	
	– (U) Develop preliminary design for all-aspect fire control system based on integration of offensive and defensive sensors.	
	– (U) Complete ground-to-air testing of radar fusion techniques for combining radar identification modes.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603203F Advanced Avionics for Aerospace Vehicles	69DF
<ul style="list-style-type: none"> - (U) \$2,225 Develop and demonstrate advanced situation awareness technologies to increase air-to-ground engagement lethality and survivability through: integration of offensive and defensive sensor technology; exploitation of off-board threat and targeting information; and timely usage of Real-Time Information Out of the Cockpit (RTOC). <ul style="list-style-type: none"> - (U) Design a RTOC approach to improve operational battle damage assessment effectiveness. - (U) Demonstrate embedded multi-source fusion subsystem to integrate electronic intelligence information with synthetic aperture radar imagery at reconnaissance stations. - (U) Develop concept for real-time embedded multi-source fusion system to vastly improve tactical aircraft situational awareness. - (U) \$6,007 Develop and demonstrate innovative air-to-ground Automatic Target Recognition (ATR) and identification technologies to increase capacity to detect, identify, and target hostile ground forces. <ul style="list-style-type: none"> - (U) Develop an integrated ATR/fusion algorithm design testbed to enable multi-sensor ATR and identification for both reconnaissance/intelligence and strike platforms. - (U) Demonstrate and evaluate current algorithms for air-to-ground, high range resolution algorithm that supports the longer radar timelines of reconnaissance radar. - (U) Measure performance of air-to-ground ATR algorithms using enhanced radar, third generation forward-looking infrared (FLIR), and multi-spectral ATR data. - (U) Complete critical design of hardware and software modifications to a fire control radar needed for an advanced capability to identify friendly and hostile ground forces. - (U) \$11,920 Total 		
(U) FY 1999 (\$ in Thousands):		
<ul style="list-style-type: none"> - (U) \$1,983 Develop and demonstrate advanced air-to-air detection, tracking, identification, and engagement technologies to provide beyond-visual-range, all-aspect, high confidence classification, identification, targeting, and all-aspect weapon deployment against conventional and reduced-signature airborne threats. <ul style="list-style-type: none"> - (U) Continue investigation of advanced sensor suites and off-board sources for long-range, high-confidence identification of airborne targets. - (U) Analyze ground test data and make necessary modifications to radar fusion techniques for combining radar identification modes. 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Avionics for Aerospace Vehicles	
		PROJECT 69DF
– (U) \$6,663	Develop and demonstrate advanced situation awareness technologies to increase air-to-ground engagement lethality and survivability through: integration of offensive and defensive sensor technology; exploitation of off-board threat and targeting information; and timely usage of Real-Time Information Out of the Cockpit (RTOC). <ul style="list-style-type: none"> – (U) Continue to demonstrate embedded multi-source fusion subsystem to integrate electronic intelligence information with synthetic aperture radar (SAR) imagery at reconnaissance stations. – (U) Flight demonstrate real-time rerouting of an F-117 using Real-Time Information In the Cockpit (RTIC) technology. – (U) Develop and flight test fusion of SAR and forward looking infrared (FLIR) algorithms on an F-15E to demonstrate improved target detection and recognition of time critical targets. 	
– (U) \$4,896	Develop and demonstrate innovative air-to-ground Automatic Target Recognition (ATR) and identification technologies to increase capacity to detect, identify, and target hostile ground forces. <ul style="list-style-type: none"> – (U) Continue to develop an integrated ATR/fusion algorithm design testbed to enable multi-sensor ATR and identification for both reconnaissance/intelligence and strike platforms. – (U) Downselect and integrate optimal algorithm that supports the longer timelines of reconnaissance radars and improves air-to-ground, high range resolution. – (U) Perform detailed performance analysis of air-to-ground ATR algorithms using enhanced radar, third generation FLIR, and multi-spectral ATR data. – (U) Begin hardware and software modifications to a fire control radar to demonstrate advanced capability for identification of friendly and hostile ground forces. 	
– (U) \$13,542	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603205F Flight Vehicle Technology
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	8,734	5,441	7,035	7,476	7,043	7,017	6,562	Continuing	Continuing
2978 Flight Vehicle Technologies	6,605	4,231	5,172	6,084	5,791	5,961	6,188	Continuing	Continuing
4398 Air Base Technology	2,129	1,210	1,863	1,392	1,252	1,056	374	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** This Advanced Technology Development program develops and demonstrates advanced vehicle subsystems, aerodynamic/flight controls, and vehicle-pilot integration technologies for improved performance, improved survivability, and reduced logistics support. This program also demonstrates technologies for fixed and bare base assets, including airfield pavements, energy systems, automation, air base survivability, air base recovery, protective systems, fire protection, and crash rescue. Note: FY 1998 decrease reflects reduced investments in aircraft tire, landing gear, and airbase operations technologies.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603205F Flight Vehicle Technology
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	8,052	5,766	6,442	Cont
(U) Appropriated Value	8,433	5,766		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-177	-188		
b. SBIR	-204	-137		
c. Omnibus/Other Above Threshold Reprogrammings				
d. Below Threshold Reprogrammings	695			
e. Rescissions	-13			
(U) Adjustments to Budget Year Since FY1998 PB			593	
(U) Current Budget Submit/FY 1999 PB	8,734	5,441	7,035	Cont.

(U) **Change Summary Explanation:**

Funding: Changes to this PE since the previous President's Budget are due to increased emphasis on flight vehicle technologies within the Science and Technology (S&T) Program. Below Threshold Reprogramming was used to complete aircraft tire and landing gear efforts necessary for transition of technology development work scheduled to be significantly reduced beginning in FY 1998.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:** Not Applicable.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998		
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603205F Flight Vehicle Technology				PROJECT 2978		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2978	Flight Vehicle Technologies	6,605	4,231	5,172	6,084	5,791	5,961	6,188	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program designs, develops, and demonstrates air vehicle technologies for improved performance, reliability, maintainability, and supportability while increasing affordability, survivability, and mission effectiveness. It is focused on exploiting advancements in air vehicle component and subsystem technologies, aerodynamic/flight control technologies, and vehicle-pilot integration technologies.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5,785 Develop and demonstrate advanced/integrated air vehicle component subsystems and vehicle-pilot integration technologies to reduce volume, weight, complexity, and cost of required spares through improved reliability, affordability, and maintainability. - (U) Completed development and demonstration of the computational system to quantitatively predict life cycle environmental conditions for air vehicles and external stores and make available for transition to System Program Office and Air Logistics Center users. - (U) Completed the development and demonstration of an advanced fighter aircraft main tire compound and tread design suitable for today's fleet and for future aircraft upgrades which have significantly longer lifetime and reduced logistics/deployment requirements. - (U) Correlated advanced analytical model predictions with realistic operational load measurements of tread wear obtained from the unique air vehicle tire wear assessment system; established the baseline for using new tire design technology to obtain extended tire life. - (U) Developed and demonstrated advanced radial tire retreading technology for current and future fighter aircraft applications; established the cost benefits and determine the reliability of retread tire technology for aircraft tire usage. - (U) \$244 Develop on-board software for automatic in-flight mission re-planning, trajectory generation, flight control coupling, and vehicle-pilot integration in order to reduce pilot workload when off-board information enters the cockpit. - (U) \$576 Develop and demonstrate advanced air vehicle and flight control concepts to provide a combat advantage for the next generation aircraft by increasing performance and survivability while decreasing both cost and supportability requirements. <ul style="list-style-type: none"> - (U) Completed flight tests of both the electrohydrostatic aileron actuator on an F/A-18 aircraft which will establish a baseline for totally eliminating hydraulic fluid from flight control actuation. - (U) Assessed future fighter aircraft development requirements to identify design and test opportunities which can exploit the application of advanced electric flight control technologies to effectively reduce aircraft weight, ground support equipment, and maintenance while improving aircraft reliability. - (U) Designed innovative intelligent controller for flight controller actuator that senses air data to predict loads, reducing actuator performance requirements. - (U) \$6,605 Total <p>Project 2978</p>										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603205F Flight Vehicle Technology	PROJECT 2978
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>– (U) \$2,334 Develop revolutionary Future Aircraft Technology Enhancements (FATE) by integrating high payoff air vehicle technologies that address and optimize synergistic benefits. <li>– (U) Completed evaluation of enhanced fighter tire life through aircraft testing and correlation with unique air vehicle tire wear assessment system and analytical model predictions for current and future aircraft application. <li>– (U) Continued developing on-board software for automatic in-flight mission re-planning, trajectory generation, flight control coupling, and vehicle-pilot integration. <li>– (U) \$462 Develop software for multiple ship integrated control strategies to enable the safe and effective cooperative employment of manned and unmanned strike vehicles for air combat operations. <li> <ul style="list-style-type: none"> <li>– (U) \$1,435 Develop and demonstrate advanced integrated air vehicle subsystems to provide increased performance and survivability while decreasing both cost and supportability requirements. <li>– (U) Developed a flight worthy electric stabilator actuator design for future flight demonstration testing that exploits advanced electric flight control technologies to effectively reduce aircraft weight, ground support equipment, and maintenance while improving aircraft reliability. <li>– (U) Demonstrated structural integrity of injection molded frameless fighter aircraft windshields to improve aircraft range and optics performance while lowering cost. Make this technology available for further risk reduction and application to current and future fighter aircraft. <li>– (U) \$4,231 Total 		
Project 2978	Page 4 of 9 Pages	Exhibit R-2 (PE 0603205F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603205F Flight Vehicle Technology	PROJECT 2978
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U) FY 1999 (\$ in Thousands):

- | | |
|---------------|--|
| – (U) \$2,405 | Develop revolutionary Future Aircraft Technology Enhancements (FATE) by integrating high payoff air vehicle technologies that address and optimize synergistic benefits. |
| | – (U) Integrate display designs for automatic in-flight mission re-planning, trajectory generation, flight control coupling, and cockpit controls in order to reduce pilot workload when off-board information enters the cockpit. |
| | – (U) Develop conceptual design for low-cost advanced aerodynamic flight demonstrator. |
- | | |
|-------------|--|
| – (U) \$987 | Develop algorithms for multiple ship integrated control strategies to enable the safe and effective cooperative employment of manned and unmanned strike vehicles for air combat operations. |
|-------------|--|
- | | |
|---------------|---|
| – (U) \$1,780 | Develop and demonstrate advanced integrated air vehicle subsystems to provide increased performance and survivability while decreasing both cost and supportability requirements. |
| | – (U) Fabricate a flight critical electric stabilator actuator for flight demonstration in an F/A-18 aircraft to enable advanced electric flight control technologies for reducing aircraft weight, ground support equipment, and maintenance while improving aircraft reliability. |
- | | |
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| – (U) \$5,172 | Total |
|---------------|-------|

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603205F Flight Vehicle Technology	PROJECT 2978
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	5,920	4,484	4,276	Cont
(U) Current Budget Submit/FY 1999 PB	6,605	4,231	5,172	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to increased emphasis on flight vehicle technologies within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602201F, Aerospace Flight Dynamics.
- (U) PE 0603216F, Aerospace Propulsion and Power.
- (U) PE 0603245F, Flight Vehicle Technology Integration.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603205F Flight Vehicle Technology				PROJECT 4398	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4398 Air Base Technology	2,129	1,210	1,863	1,392	1,252	1,056	374	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: This project develops technologies for fixed and bare base operations, including airfield pavements, energy systems, air base survivability, air base recovery, protective systems, fire protection, and crash rescue.</p> <p>(U) FY 1997 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$878 Develop and demonstrat technologies for improved bare base and fixed site applications (e.g., survivable air base structures and durable or repairable airfield surfaces). <ul style="list-style-type: none"> - (U) Completed development of man-portable ground penetrating radar for bare base contingency runway conditions. - (U) Assessed advanced hardening techniques and processes for upgrading existing air base buildings and assets. - (U) Completed development of protective systems using in-theater materials to harden critical air base assets in contingency operations. - (U) Demonstrated deployable pavement evaluation techniques for rapid assessment of bare base runway conditions. - (U) \$776 Develop aircraft and air base fire fighting technologies (e.g., clean, environmentally-safe fire fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and fire fighter training systems). <ul style="list-style-type: none"> - (U) Continued development of advanced hypergolic vapor and fuel fire detection/suppression technologies. - (U) Demonstrated performance of environmentally acceptable aqueous film forming foam, a replacement agent for Halon. - (U) Completed large frame aircraft fire fighting program to aid in extinguishing external and internal fires of transport aircraft. - (U) Developed advanced fire crash and rescue vehicle technologies to assist fire fighters in search and rescue operations. - (U) Developed vision enhancement technologies to assist fire fighters in search and rescue operations. - (U) \$475 Develop aircraft power generation technologies (e.g., lightweight generator systems and advanced fuel cells). <ul style="list-style-type: none"> - (U) Demonstrated conversion of bare base waste stream into an energy source. - (U) Conducted field tests of brassboard for advanced cycle mobile heat pump. - (U) Completed development of control improvements in backup power generation systems. - (U) \$2,129 Total 									
Project 4398	Page 7 of 9 Pages				Exhibit R-2 (PE 0603205F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603205F Flight Vehicle Technology	PROJECT 4398
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,210 Develop aircraft and air base fire fighting technologies (e.g., environmentally-safe fire fighting agents, vehicles, equipment, personnel protective clothing, fire risk assessment techniques, and fire fighter training systems). <ul style="list-style-type: none"> - (U) Developed microencapsulated phase change materials for thermal barrier for fire fighting ensembles. - (U) Completed development of biodegradable aqueous film forming foam replacement. - (U) Developed fire threat versus response capability model. - (U) \$0 Develop aircraft and air base fire fighting technologies (e.g., utilities and shelters) that improve air mobile systems performance and reduce airlift requirements in support of Air Expeditionary Force (AEF) operations. <ul style="list-style-type: none"> - (U) Continued development of prototype acoustic cycle heat pump. - (U) Developed advanced hardening techniques to protect existing contingency air base buildings and assets. - (U) \$1,210 Total <p>(U) <u>FY 1999 (\$ in Thousands) :</u></p> <ul style="list-style-type: none"> - (U) \$700 Develop aircraft and air base fire fighting and power generation technologies (e.g., clean environmentally safe fire fighting agents, equipment, personnel protective clothing, fire risk assessment techniques, and fire fighter training systems). <ul style="list-style-type: none"> - (U) Develop virtual reality fire fighter training technology to provide cost effective, realistic training and protect the environment. - (U) Complete microencapsulated phase change materials for thermal barrier for firefighter ensembles - (U) Complete development of fire threat versus response capability model. - (U) \$1,163 Develop technologies (i.e., utilities and shelters) that improve air mobility systems performance and reduce airlift requirements in support of Air Expeditionary Forces (AEF) operations. <ul style="list-style-type: none"> - (U) Complete development of a prototype acoustic cycle heat pump. - (U) Fabricate a prototype logistics fuel reformer for AEF applications. - (U) Construct and air transportable shelter advanced development model for field testing. - (U) \$1,863 Total 		
Project 4398	Page 8 of 9 Pages	Exhibit R-2 (PE 0603205F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603205F Flight Vehicle Technology	PROJECT 4398																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">2,132</td> <td style="text-align: center;">1,282</td> <td style="text-align: center;">2,166</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">2,129</td> <td style="text-align: center;">1,210</td> <td style="text-align: center;">1,863</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to increased emphasis on flight vehicle technologies within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602201F, Aerospace Flight Dynamics. - (U) PE 0603307F, Air Base Operability Advanced Technology Development. - (U) PE 0603231F, Crew Systems and Personnel Protection Technology. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	2,132	1,282	2,166	Cont	(U) Current Budget Submit/FY 1999 PB	2,129	1,210	1,863	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	2,132	1,282	2,166	Cont														
(U) Current Budget Submit/FY 1999 PB	2,129	1,210	1,863	Cont														
Project 4398	Page 9 of 9 Pages	Exhibit R-2 (PE 0603205F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603211F Aerospace Structures	PROJECT 486U
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
486U Advanced Aerospace Structures	9,398	9,734	12,494	14,435	15,041	16,434	16,932	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. **Mission Description and Budget Item Justification:** This Advanced Technology Development program develops and demonstrates affordable aircraft structures by utilizing innovative metallic and composite structures technologies to reduce the cost of airframe ownership. Innovative structural concepts integrate these two types of materials with design and monitoring techniques to develop and demonstrate solutions and repairs for corrosion fatigue, multi-site damage fatigue, and other damage to which aging aircraft are susceptible. The goal of this program is to develop technologies to restore structural integrity, extend life, and improve survivability of the current fleet. The results are less maintenance intensive, more durable, and more dependable structures for current aerospace systems. This yields lower cost of ownership (by delaying acquisition and by reducing support and maintenance costs), restored and improved sortie rates (due to durability, damage or threat tolerance, and design for supportability), and reduced observability (both radar cross section and infrared). Note: In FYs 1998 and out, additional emphasis has been placed on aerospace structures technology to meet user needs identified by the Air Force aging aircraft initiative to extend the life of existing operational aircraft.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603211F Aerospace Structures	PROJECT 486U
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$1,529 Develop and assess processes for extending the structural life of aircraft. <ul style="list-style-type: none"> – (U) Conducted ground testing of an installed wing spar for replacement of corrosion-sensitive components in an existing aircraft. – (U) Developed preliminary corrosion fatigue predictive models which incorporate observed corrosion phenomenon of operational aircraft structures to better assess structural integrity, life, and intervals of inspection for corrosion affected components in existing aircraft. – (U) Developed composite repair processes for damaged and cracked metallic components for existing aircraft applications. – (U) Demonstrated built-in structural health monitoring in a full-scale fighter bulkhead; evaluated for capability to automate crack growth inspections and, thereby, reduce structural maintenance, repair, and replacement costs. – (U) \$2,026 Improve durability and performance of vehicle structures operating in extreme thermal and acoustic environments. <ul style="list-style-type: none"> – (U) Completed laboratory testing of small metallic, exhaust-impinged aft fuselage subcomponents and fabricated a larger subcomponent to overcome structural failures of components in severe thermal and acoustic environments. – (U) Completed testing of an advanced wing box component on a military aircraft airframe subject to extreme, high temperatures and assessed its impact on aircraft survivability. – (U) Completed preliminary design of an integrated aft fuselage and nozzle section structure to reduce weight and improve aircraft performance. – (U) \$5,409 Develop advanced structural concepts and design methods for future and existing air vehicles. <ul style="list-style-type: none"> – (U) Conducted detailed design of aircraft structural component to demonstrate significant increase in survivability of existing military aircraft. – (U) Completed detailed design of sandwich structures that reduce weight and cost in aircraft primary structure applications. – (U) Completed durability and damage testing of a composite fuselage structure which will reduce manufacturing costs by 50% and supportability costs by 25%. – (U) Completed preliminary design of a flexible wing that twists to control flight, significantly improving maneuverability and range, and reducing air vehicle structural weight. – (U) Completed detailed design of an advanced, affordable airframe that maximizes use of composite structures. – (U) \$434 Develop advanced airframe concepts which integrate structures with distributed actuators and sensors. <ul style="list-style-type: none"> – (U) Completed ground test of conformal, load bearing antenna structure which reduces cost, weight, drag, and enhances low-observable characteristics while providing new and improved antenna performance. – (U) \$9,398 Total 		
Project 486U	Page 2 of 5 Pages	Exhibit R-2 (PE 0603211F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603211F Aerospace Structures	
		PROJECT 486U
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$3,956	Develop and assess processes for extending the structural life of aircraft. – (U) Complete ground and flight tests of a wing spar to demonstrate replacement of corrosion-sensitive components in an existing aircraft.	
– (U) \$1,302	Improve durability and performance of vehicle structures operating in extreme thermal and acoustic environments. – (U) Complete laboratory testing of a large metallic, exhaust-impinged aft fuselage subcomponent to overcome structural failures in severe thermal and acoustic environments. – (U) Complete detailed design of an integrated aft fuselage and nozzle section structures to reduce weight and improve aircraft performance.	
– (U) \$4,476	Develop advanced structural concepts and design methods for future and existing air vehicles. – (U) Complete detailed design of sandwich structure component that reduces weight and cost in aircraft primary structure applications. – (U) Complete development of flight computer software for flight demonstration of a flexible wing that twists to control flight, significantly improving maneuverability, increasing range, and reducing air vehicle structural weight. – (U) Identify new analysis methods and design criteria for advanced composite structures. – (U) Complete ground testing of a composite wing structure which will reduce manufacturing costs by 50% and supportability costs by 25%.	
– (U) \$9,734	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603211F Aerospace Structures	PROJECT 486U
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li>– (U) \$6,317 Improve durability and performance of vehicle structures operating in extreme thermal and acoustic environments. <li>– (U) Complete fabrication of an integrated aft fuselage and nozzle section structures to reduce weight and improve aircraft performance. <li>– (U) \$6,177 Develop advanced structural concepts and design methods for future and existing air vehicles. <li>– (U) Fabricate a full-scale structural component to demonstrate significant increase in survivability of existing military aircraft. <li>– (U) Conduct ground testing of sandwich structural component that reduces weight and cost in aircraft primary structure applications. <li>– (U) Complete modification of an aircraft for flight demonstration of a flexible wing that twists to control flight, significantly improving maneuverability and range, and reducing air vehicle structural weight. <li>– (U) Develop and apply new analysis methods and design criteria to advance composite structures to reduce life cycle costs by maximizing use of composite structures. <li>– (U) \$12,494 Total 		
Project 486U	Page 4 of 5 Pages	Exhibit R-2 (PE 0603211F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	34,464	33,126	38,984	40,524	42,132	42,128	43,864	Continuing	Continuing
2480 Aerospace Fuels and Atmospheric Propulsion	2,969	1,533	2,059	2,250	2,212	3,151	3,264	Continuing	Continuing
3035 Aerospace Power Systems Technology	2,601	3,472	3,399	3,823	3,959	4,180	4,355	Continuing	Continuing
681B Advanced Turbine Engine Gas Generator	28,894	28,121	33,526	34,451	35,961	34,797	36,245	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1998, Project 2480, Aerospace Fuels Technology, and Project 2697, Atmospheric Propulsion Concepts, are combined into a single project, Project 2480, Aerospace Fuels and Atmospheric Propulsion. The total PE costs shown for FY 1997 reflect this consolidation.

(U) **A. Mission Description and Budget Item Justification:** This Advanced Technology Development program develops and demonstrates affordable turbine engine high pressure core components, advanced airbreathing engine concepts, high heat sink and thermally stable fuels, and power technology for aerospace vehicles. Anticipated technology advances include turbine engine improvements providing a 33% reduction in aircraft takeoff gross weight for tactical fighter aircraft and a 100% increase in aircraft range/loiter; ducted rocket improvements that increase missile average and terminal velocity by 50% and range by 100% for enhanced lethality; higher temperature fuels for propulsion and thermal management; an aircraft battery with a 20-year maintenance-free life expectancy; and electric aircraft power components projected to provide a two- to five-fold improvement in reliability and maintainability, a 20% reduction in power system weight, and enhanced survivability. Note: FY 1998 and out increases in Project 3035, Aerospace Power Systems Technology, reflect demonstration of the aircraft electric power distribution system.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development		PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>
(U) Previous President's Budget (FY 1998 PB)	36,506	37,014	39,836	Cost
(U) Appropriated Value	38,264	35,183		Cont
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-801	-1,148		
b. SBIR	-957	-909		
c. Omnibus/Other Above Threshold Reprogrammings	-1,982			
d. Below Threshold Reprogrammings				
e. Rescissions	-60			
(U) Adjustments to Budget Year Since FY 1998 PB			-852	
(U) Current Budget Submit/FY 1999 PB	34,464	33,126	38,984	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology				PROJECT 2480	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2480 Aerospace Fuels and Atmospheric Propulsion	2,969	1,533	2,059	2,250	2,212	3,151	3,264	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Develops and demonstrates new thermally stable and high heat sink fuels and advanced fuel system components that minimize cost, reduce maintenance, and improve performance of aircraft and missiles. Emphasis is on demonstrating the effects/benefits of JP-8+100 on current systems, and advanced high temperature fuel system designs and components on upgraded and advanced systems. Demonstrates unconventional airbreathing propulsion subsystems such as ramjets, air turbo-rockets, dual-mode ramjets, and combined/advanced-cycle engines to assure future propulsion options for high-speed missiles.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,281 Demonstrated thermally stable JP-8+100 and high heat sink fuels that reduce fuel system maintenance on current aircraft and provide greater cooling capacity (performance) for upgraded and future aircraft and missiles. <ul style="list-style-type: none"> - (U) Demonstrated effects/benefits of JP-8+100 in component and engine stand tests of T64, F101, and TF53 engines. - (U) Demonstrated reduced fuel system maintenance in aircraft (T-37, T-38, C-130) by conducting field trial of JP-8+100 at selected bases. - (U) \$208 Demonstrated advanced fuel system designs and high temperature components that permit utilization of the increased cooling capacity of JP-8+100 and high heat sink fuels. <ul style="list-style-type: none"> - (U) Demonstrated high heat sink fuel capacity of JP8+100 in a reduced-scale fuel/air heat exchanger designed to replace less efficient ram air/fuel heat exchangers for engine cooling in upgraded systems. 									
Project 2480			Page 3 of 13 Pages			Exhibit R-2 (PE 0603216F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603216F Aerospace Propulsion and Power Technology	2480
<ul style="list-style-type: none"> - (U) \$1,380 Developed Variable Flow Ducted Rocket (VFDR) for airbreathing missile applications. This effort transitions technology to current and future tactical missiles providing longer range, higher velocities, and increased maneuverability, resulting in improved overall missile effectiveness. <ul style="list-style-type: none"> - (U) Completed rocket-to-ramjet mode transition and performance documentation testing to demonstrate technology maturity for advanced missile propulsion applications. - (U) Completed ground technology demonstration of VFDR technology and document results. - (U) \$100 Developed and demonstrated the design and construction of critical high-speed propulsion components/structures for manned and unmanned applications. This effort provides technology at lowered risk for future missile systems where time-to-target is critical and provides technology for next generation reconnaissance/strike vehicles and airbreathing boosters. <ul style="list-style-type: none"> - (U) Planned design/development of dual-mode ramjet engines for high-speed missiles for destroying high value, time-critical targets. - (U) Planned design/development of combined/advanced-cycle engines for manned and unmanned high-speed vehicles applicable to reconnaissance/strike missions. - (U) Completed preliminary scramjet critical loads assessment. - (U) \$2,969 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$940 Demonstrate thermally stable JP-8+100 and high heat sink fuels that reduce fuel system maintenance on current aircraft and provide greater cooling capacity (performance) for upgraded and future aircraft and missiles. <ul style="list-style-type: none"> - (U) Demonstrate effects/benefits of second JP-8+100 thermal stability additive package in component and engine stand tests. - (U) \$193 Demonstrate effectiveness of thermally stable JP-8+100 for reduced maintenance in variety of aircraft. <ul style="list-style-type: none"> - (U) Demonstrate reduced fuel system maintenance in B-1 and C-141 aircraft and in HH-53, H-1, and HH-60 helicopters by conducting field trials of JP-8+100 at selected bases. - (U) \$340 Demonstrate advanced fuel system designs and high temperature components that permit utilization of the increased cooling capacity of JP-8+100 and high heat sink fuels. <ul style="list-style-type: none"> - (U) Complete design and evaluation of upgraded F-15 fuel system modifications that permit utilization of increased cooling capacity of JP-8+100. - (U) \$60 Complete final documentation on VFDR technology and concepts. - (U) \$1,533 Total 		
Project 2480	Page 4 of 13 Pages	Exhibit R-2 (PE 0603216F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology	PROJECT 2480
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,437 Demonstrate thermally stable JP-8+100 and high heat sink fuels that reduce fuel system maintenance on current aircraft and provide greater cooling capacity (performance) for upgraded and future aircraft and missiles. <ul style="list-style-type: none"> - (U) Demonstrate effects/benefits of JP-8+100 in Integrated High Performance Turbine Engine Technology (IHPTET) Phase II demonstrator. - (U) \$211 Demonstrate effectiveness of thermally stable JP-8+100 for reduced maintenance in variety of aircraft. <ul style="list-style-type: none"> - (U) Complete field trials of JP-8+100. - (U) \$311 Demonstrate advanced fuel system designs and high temperature components that permit utilization of the increased cooling capacity of JP-8+100 and high heat sink fuels. <ul style="list-style-type: none"> - (U) Design high heat sink fuel/air heat exchanger suitable for incorporation into IHPTET Phase III demonstrator. - (U) \$100 Develop and demonstrate the design and construction of critical high-speed propulsion components/structures for manned and unmanned applications. This effort provides technology at lowered risk for future missile systems where time-to-target is critical and provides technology for next generation reconnaissance/strike vehicles and airbreathing boosters. <ul style="list-style-type: none"> - (U) Design critical high temperature structures for high speed unmanned applications. - (U) \$2,059 Total 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology		PROJECT 2480	
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	4,025	1,625	2,145	Cont
(U) Current Budget Submit/FY 1999 PB	2,969	1,533	2,059	Cont
(U) Change Summary Explanation:				
Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
- (U) PE 0602203F, Aerospace Propulsion.				
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
Project 2480	Page 6 of 13 Pages		Exhibit R-2 (PE 0603216F)	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology	PROJECT 3035
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3035 Aerospace Power Systems Technology	2,601	3,472	3,399	3,823	3,959	4,180	4,355	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification:** Develops and demonstrates aircraft and ground power systems including engine starters, auxiliary power units, and electrical power distribution systems. The principal focus is to provide a two- to five-fold improvement in reliability and maintainability and significantly reduced cost of ownership for aircraft and ground power systems. This will be accomplished by replacing fluid-powered (hydraulics/bleed air) accessories with electrically-powered systems. Representative improvements include increased reliability (8-18%); improved maintainability (9-12%); and reduced vulnerability (12-14%).

(U) FY 1997 (\$ in Thousands):

- (U) \$1,076 Designed, fabricated, and tested an electrical distribution system which ensures fault tolerant architecture, improving aircraft reliability and survivability.
 - (U) Initiated testing of fault tolerant 270 Vdc power system demonstrating fault tolerance and a 40% reduction in weight.
- (U) \$935 Designed, fabricated, and tested components supporting a demonstrator aircraft electrical distribution system.
 - (U) Initiated fabrication and testing of advanced motor controller for aircraft demonstrating a 50% improvement in power density.
- (U) \$590 Designed, fabricated, and tested a demonstrator aircraft on-board Integrated Power Unit (IPU). The IPU is critical for aircraft engine starting, auxiliary power, and emergency power.
 - (U) Completed preliminary design of aircraft on-board IPU hardware which will demonstrate the integration of auxiliary and engine electrical starting power functions providing a two- to three-fold increase in reliability and a two-fold reduction in weight.
- (U) \$2,601 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology	PROJECT 3035
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$1,048	Design, fabricate, and test an electrical distribution system which ensures fault tolerant architecture, improving aircraft reliability and survivability.	
– (U) \$424	– (U) Test fault tolerant 270 Vdc power system demonstrating fault tolerance and a 40% reduction in weight. Design, fabricate, and test components supporting a demonstrator aircraft electrical distribution system.	
– (U) \$2,000	– (U) Complete fabrication and testing of advanced motor controller for aircraft demonstrating a 50% improvement in power density. Design, fabricate, and test a demonstrator aircraft on-board Integrated Power Unit (IPU). The IPU is critical for aircraft engine starting, auxiliary power, and emergency power.	
– (U) \$3,472	– (U) Complete detailed design of aircraft on-board IPU hardware which will demonstrate the integration of auxiliary and engine electrical starting power functions providing a two- to three-fold increase in reliability and a two-fold reduction in weight. Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$441	Design, fabricate, and test an electrical distribution system which ensures fault tolerant architecture, improving aircraft reliability and survivability.	
– (U) \$1,000	– (U) Complete testing of fault tolerant 270 Vdc power system demonstrating fault tolerance and a 40% reduction in weight. Develop an aircraft electrical power generation and distribution system for test validation and flight demonstration. The electrical distribution system ensures fault tolerant architecture, improving aircraft reliability and survivability.	
– (U) \$1,958	– (U) Initiate development of an advanced aircraft electrical power generation and distribution system. The advanced electrical power system provides a two- to three-fold improvement of system reliability. Design, fabricate, and test a demonstrator aircraft on-board IPU. The IPU is critical for aircraft engine starting, auxiliary power, and emergency power.	
– (U) \$3,399	– (U) Fabricate components for aircraft on-board IPU which will demonstrate the integration of auxiliary and engine electrical starting power functions providing a two- to three-fold increase in reliability and a two-fold reduction in weight. Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology	PROJECT 3035																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;">Total <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">2,605</td> <td style="text-align: center;">3,682</td> <td style="text-align: center;">3,467</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">2,601</td> <td style="text-align: center;">3,472</td> <td style="text-align: center;">3,399</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602203F, Aerospace Propulsion. - (U) PE 0602201F, Aerospace Flight Dynamics. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	2,605	3,682	3,467	Cont	(U) Current Budget Submit/FY 1999 PB	2,601	3,472	3,399	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	2,605	3,682	3,467	Cont														
(U) Current Budget Submit/FY 1999 PB	2,601	3,472	3,399	Cont														
Project 3035	Page 9 of 13 Pages	Exhibit R-2 (PE 0603216F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology				PROJECT 681B		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
681B	Advanced Turbine Engine Gas Generator	28,894	28,121	33,526	34,451	35,961	34,797	36,245	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops turbine engine gas generator technology to meet the requirements of current and future aircraft propulsion systems. The objective is to provide the continued evolution of technologies into an advanced gas generator in which the performance, cost, durability, repairability, and maintainability aspects can be assessed in a real engine environment. The gas generator, or core, is the basic building block of the engine and it consists of a compressor, a combustor, and a high pressure turbine. Experimental core engine testing enhances early, low-risk transition of key engine technologies into engineering development where they can be applied to derivative and/or new systems. These technologies are applicable to a wide range of military and commercial systems including aircraft, missiles, land combat vehicles, and ships. The Advanced Turbine Engine Gas Generator project supports the Integrated High Performance Turbine Engine Technology (IHPTET) program. IHPTET is a three phase, totally integrated DoD, DARPA, NASA, and industry program focused on doubling turbine engine propulsion capabilities while reducing cost of ownership. The IHPTET program structure provides continuous technology transition for military turbine engine upgrades and derivatives and has the added benefit of enhancing the U.S. turbine engine industry's international competitiveness and demonstrates affordable turbine engine high pressure core components.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$23,400 Designed, fabricated, and initiated performance testing of technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and large transports. <ul style="list-style-type: none"> - (U) Tested a turbofan/turbojet core engine demonstrating a 60% increase in thrust-to-weight ratio, a 20% reduction in manufacturing cost, and a 20% reduction in maintenance costs. - (U) \$4,212 Designed, fabricated, and conducted durability testing of technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and large transports. <ul style="list-style-type: none"> - (U) Conducted a high temperature durability test of turbofan/turbojet core engine demonstrating critical technology potential life characteristics. - (U) \$1,282 Designed, fabricated, and tested technology demonstration core engines for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, theater transports, and large uninhabited air vehicles. <ul style="list-style-type: none"> - (U) Tested a turboprop/turboshaft core engine demonstrating a 30% reduction in fuel consumption and an 80% increase in power-to-weight ratio. - (U) \$28,894 Total 										
Project 681B		Page 10 of 13 Pages					Exhibit R-2 (PE 0603216F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology	PROJECT 681B
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$25,086 Design, fabricate, and performance test technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and large transports. <ul style="list-style-type: none"> - (U) Fabricate hardware (high temperature metal matrix composite compressor rotor, advanced nickel turbine disk) and assemble a core engine for high compressor exit temperature testing (30% reduction in fuel consumption). - (U) Design and fabricate core engine hardware (high stage loading compressor, dual-web turbine disk, air to fuel heat exchanger) in support of core engine testing to provide a 40% reduction in fuel consumption, a 100% increase in thrust-to-weight ratio, a 35% reduction in manufacturing cost, and a 35% reduction in maintenance cost. - (U) \$617 Design, fabricate, and durability test technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and large transports. <ul style="list-style-type: none"> - (U) Conduct cyclic durability testing of a turbofan/turbojet core engine demonstrating critical technology potential life characteristics. - (U) \$2,418 Design, fabricate, and test technology demonstration core engines for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, theater transports, and large uninhabited air vehicles. <ul style="list-style-type: none"> - (U) Test a turboprop/turboshaft core engine demonstrating a 28% reduction in fuel consumption and a 102% increase in power-to-weight ratio. - (U) Initiate the design of a turboprop/turboshaft core engine with a 40% reduction in fuel consumption, a 120% increase in power-to-weight ratio, a 35% reduction in manufacturing cost, and a 35% reduction in maintenance cost. - (U) \$28,121 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$21,758 Design, fabricate, and performance test technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and large transports. <ul style="list-style-type: none"> - (U) Fabricate hardware for an advanced core engine with a high stage loading compressor, dual web turbine disk, and air to fuel heat exchanger to provide an initial assessment of these critical technologies required to provide a 40% reduction in fuel consumption, a 100% increase in thrust-to-weight ratio, a 35% reduction in manufacturing cost, and a 35% reduction in maintenance cost. - (U) \$7,847 Design, fabricate, and durability test technology demonstration core engines for turbofan/turbojet engines for fighters, attack aircraft, bombers, and large transports. <ul style="list-style-type: none"> - (U) Conduct high compressor exit temperature testing (30% reduction in fuel consumption) of an advanced core engine with a high temperature metal matrix composite compressor rotor and an advanced nickel turbine disk. 		
Project 681B	Page 11 of 13 Pages	Exhibit R-2 (PE 0603216F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603216F Aerospace Propulsion and Power Technology	PROJECT 681B
<ul style="list-style-type: none"> - (U) \$3,921 	<ul style="list-style-type: none"> Design, fabricate, and test technology demonstration core engines for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, theater transports, and large uninhabited air vehicles. - (U) Test a turboprop/turboshaft core engine demonstrating a 30% reduction in fuel consumption, a 112% increase in power-to-weight ratio, a 20% reduction in manufacturing cost, and a 20% reduction in maintenance cost. - (U) Complete the design of a turboprop/turboshaft core engine with a 40% reduction in fuel consumption, a 120% increase in power-to-weight ratio, a 35% reduction in manufacturing cost, and a 35% reduction in maintenance cost. 	
<ul style="list-style-type: none"> - (U) \$33,526 	<ul style="list-style-type: none"> Total 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603227F Personnel, Training, and Simulation Technology				PROJECT 2743		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2743 Advanced Training/Force Management	6,928	5,668	6,636	6,165	7,013	5,667	5,836	Continuing	Continuing	
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	

Note: Beginning in FY 1998, the three projects in this Program Element (Project 2743, Combat Aircrew Training Technology; Project 2922, Manpower and Force Management; and Project 2949, Advanced Training Technology) have been combined into a single project (Project 2743, Advanced Training/Force Management). The total PE costs shown for FY 1997 reflect this consolidation.

(U) **A. Mission Description and Budget Item Justification:** This Advanced Technology Development program develops and demonstrates Manpower, Personnel, and Training (MPT) technologies that will result in improved warfighter readiness. Develops, demonstrates, and evaluates technologies for distributed mission training including realistic, effective, and affordable synthetic combat environments, technologies for long distance networking to enhance joint-Service training, visual displays for real-time and post-mission debrief, instructional strategies to support warfighter training in a joint synthetic battlespace. Provides a technology testbed for examining warfighter skills, cognitive functions, and behaviors contributing to combat readiness. Develops and demonstrates technologies necessary to provide realistic training for night time warfighting. Develops and demonstrates computer-based intelligent tutoring technology for representative tasks in high technology jobs, and software to enable Air Force training developers to rapidly and affordably build intelligent computer assisted training systems which continually interact with students for effective individualized training. Develops and demonstrates information management technology for the warfighter at the unit level.

Project 2743
Page 1 of 5 Pages
Exhibit R-2 (PE 0603227F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603227F Personnel, Training, and Simulation Technology	PROJECT 2743
(U) <u>FY 1997 (\$ in Thousands):</u>		
– (U) \$2,050	Developed, demonstrated, and evaluated aircrew training devices and associated technology for air warrior training.	
	– (U) Demonstrated a low-cost, high-fidelity, deployable C-130 simulator.	
	– (U) Designed a simulated threat system to encompass a full range of electronic threat environments for air-to-air, air-to-ground, and communication jamming applications.	
	– (U) Integrated mission planning tools with distributed mission training.	
	– (U) Defined High Level Architecture (HLA) requirements for application to fighter level operations.	
	– (U) Demonstrated integrated virtual and constructive environments for distributed mission training.	
	– (U) Defined information requirements for deployable mission support station.	
– (U) \$1,888	Developed and demonstrated Night Vision Goggle (NVG) training and guidelines to meet Air Force requirements.	
	– (U) Developed NVG mishaps lessons learned courseware.	
	– (U) Demonstrated real-time simulation of incompatible lighting effects in NVG imagery.	
	– (U) Developed evaluation techniques for aircraft external lighting for NVG operations.	
	– (U) Developed and evaluated low-cost visual display suitable for NVG simulator-based training.	
	– (U) Developed metrics to assess NVG simulation quality.	
– (U) \$ 968	Developed technologies to structure Air Force and DoD jobs and classify personnel to maximize individual and organizational personnel readiness, job performance, and mission accomplishment.	
	– (U) Developed an inter-Service occupational classification technology for manpower planning.	
	– (U) Conducted independent validation and verification of Manpower, Personnel, and Training Decision Support System.	
– (U) \$ 226	Evaluated a learning sample approach to aircrew selection.	
– (U) \$ 894	Developed and demonstrated software and authoring tools for intelligent tutors.	
	– (U) Continued to develop virtual environment authoring technology.	
	– (U) Developed and evaluated advanced intelligent tutors for application to formal technical training programs and on-the-job training.	
– (U) \$ 444	Delivered career field decision support software for personal computer use to Air Force customers.	
	– (U) Completed field assessment of the training impacts decision technology.	
	– (U) Made available for transition to operational Air Force training impacts decision technology.	
– (U) \$ 458	Developed advanced instructional design advisor technology to reduce the cost and time to design and develop interactive courseware.	
	– (U) Integrated functional and procedural instructional design guidance into authoring design demonstrations.	
– (U) \$6,928	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603227F Personnel, Training, and Simulation Technology	PROJECT 2743
(U) <u>FY 1998 (\$ in Thousands):</u>		
- (U) \$2,401	Develop, demonstrate, and evaluate aircrew training devices and associated technologies for air warrior training.	
	- (U) Evaluate a high resolution microlaser projector for full combat mission training.	
	- (U) Develop a simulated command and control model.	
	- (U) Demonstrate four-aircraft testbed capability for distributed mission training.	
	- (U) Update functional specification for multi-level security networked simulation environment.	
	- (U) Demonstrate mobile, interactive, air and ground threat environment.	
	- (U) Demonstrate preliminary implementation of High Level Architecture (HLA) in four-aircraft testbed environment.	
- (U) \$1,802	Develop and demonstrate Night Vision Goggle (NVG) training guidelines to meet Air Force requirements.	
	- (U) Develop NVG mishaps lessons learned courseware.	
	- (U) Field test distance estimation training module.	
	- (U) Develop specification for NVG gain.	
	- (U) Develop specification for external lighting for NVG operation.	
	- (U) Develop recommendations for enhanced multi-spectral database.	
	- (U) Demonstrate proof-of-concept of enhanced NVG simulation.	
- (U) \$1,201	Develop, demonstrate, and evaluate knowledge representation technologies for human performance enhancement.	
	- (U) Demonstrate generalizeable knowledge representation scheme and student modeling module.	
	- (U) Initiate migration of knowledge representation technologies for human performance assessment to the JAVA computer language.	
- (U) \$ 264	Develop advanced instructional design advisor capability to support team-based instructional design.	
	- (U) Integrate wide area network capability into advanced instructional design advisor.	
- (U) \$5,668	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603227F Personnel, Training, and Simulation Technology	PROJECT 2743
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$2,380 Develop and evaluate technologies for Distributed Mission Training (DMT) environments. <ul style="list-style-type: none"> – (U) Demonstrate mobile, interactive air and ground defense simulation system. – (U) Demonstrate preliminary implementation of High Level Architecture (HLA) in multi-aircraft testbed environment. – (U) Integration of high resolution projection system without the window visual display. – (U) \$ 789 Develop and evaluate training methodologies to optimize training in DMT environments. <ul style="list-style-type: none"> – (U) Use eye tracking technology to develop optimized visual scan training to enhance situation awareness in multi-ship combat training. – (U) Implement and evaluate automated performance measures for crew debrief. – (U) Evaluate training effectiveness of advanced combat training in multi-ship simulation scenarios. – (U) Demonstrate and evaluate advanced instructional tools for squadron level electronic classroom. – (U) \$2,067 Develop and demonstrate Night Vision Goggle (NVG) training guidelines to meet Air Force requirements. <ul style="list-style-type: none"> – (U) Develop and evaluate optimized perceptual training guidelines which will help aviators interpret unnatural aspects of NVG and other cockpit displays during night missions. – (U) Evaluate fidelity and training effectiveness of real-time optimized NVG imagery for ground based simulation training. – (U) Evaluate training implications of advanced fused sensor technology. – (U) Provide technical support in areas of acquisition and flight test, lighting compatibility evaluation principles, and mishap investigations – (U) Develop advanced weapon system NVG courseware. - (U) \$1,400 Develop, demonstrate, and evaluate knowledge representation technologies for human performance enhancement. <ul style="list-style-type: none"> – (U) Initiate evaluation of knowledge based intelligent computer adaptive instruction authoring system. – (U) Continue migration of knowledge representation technologies for human performance assessment to the JAVA computer language. – (U) \$6,636 Total 		
Project 2743	Page 4 of 5 Pages	Exhibit R-2 (PE 0603227F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998	
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603227F Personnel, Training, and Simulation Technology	PROJECT 2743		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	7,420	6,147	7,182	Cont
(U) Appropriated Value	7,761	6,147		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reduction	-165	-320		
b. SBIR	-176	-159		
c. Omnibus/Other Above Threshold Reprogrammings	-472			
d. Below Threshold Reprogrammings	-8			
e. Rescissions	-12			
(U) Adjustments to Budget Year Since FY 1998 PB			-546	
(U) Current Budget Submit/FY 1999 PB	6,928	5,668	6,636	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
- (U) PE 0602202F, Armstrong Lab Exploratory Development.				
- (U) PE 0604227F, Flight Simulator Development.				
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603231F Crew Systems & Personnel Protection Technology
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	22,191	24,881	16,603	17,356	18,267	15,862	16,265	Continuing	Continuing
2830 Crew Workstations, Life Support, and Escape	15,456	14,407	10,181	10,708	11,453	9,232	9,457	Continuing	Continuing
3257 Helmet-Mounted Sensory Technologies	6,735	10,474	6,422	6,648	6,814	6,630	6,808	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1998, three projects (Project 2829, Crew-Centered Cockpit Design; Project 2830, Advanced Life Support; and Project 2868, Crew Escape) are combined into a single project (Project 2830, Crew Workstations, Life Support, and Escape). The total project costs for Project 2830 shown in FY 1997 reflect this consolidation.

(U) **A. Mission Description and Budget Item Justification:** This Advanced Technology Development program develops and demonstrates technologies to protect and enhance the performance of Air Force personnel in operational environments. Specific projects within this PE advance and integrate human factors technologies into crew workstation, life support, and protective equipment designs. These technologies encompass the development and demonstration of high-speed escape system flight control and life protection devices for high-speed, adverse attitude flight regimes to include those derived from the Russian ejection seat (U.S. - Russian cooperation). Improves life support technologies principally focused on protecting aircrew from effects of altitude and G-forces in high performance aircraft and adjusting specifications of existing equipment to accommodate the increasing operational envelope and a more diversified population of aircrew members. Improves the ability to quantify crew system automation requirements through data from constructive analysis and real-time distributed simulation. Using models of human perception and knowledge of cognitive function, and performance in high workload environments, technologies will be developed that will incorporate advanced helmet-mounted capability tracker and displays for target detection, identification, sighting, and weapons firing. Improved helmet-mounted night vision device capability and laser eye protection capability will be incorporated to address the operational limitations of fighting at night and in hazardous laser environments. Additionally, advanced on-board oxygen generation systems will be developed to alleviate the logistics burden of current liquid oxygen systems that require ground-based oxygen generation plants. Note: Congress added \$9 million in FY 1998 for crew escape/ejection seats (\$5 million), helmet-mounted display (\$3 million), and laser-eye protection (\$1 million), which explains the perceived decrease in FYs 1999 and out.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development		PE NUMBER AND TITLE 0603231F Crew Systems & Personnel Protection Technology		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	21,442	17,204	17,966	Cont
(U) Appropriated Value	22,969	26,204		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-489	-959		
b. SBIR	-538	-364		
c. Omnibus/Other Above Threshold Reprogrammings	-1,215			
d. Below Threshold Reprogrammings	1,500			
e. Rescissions	-36			
(U) Adjustments to Budget Year Since FY1998 PB			-1,363	
(U) Current Budget Submit/FY 1999 PB	22,191	24,881	16,603	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program. Below Threshold Reprogramming was for Cockpit Mapping efforts.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603231F Crew Systems & Personnel Protection Technology				PROJECT 2830		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2830 Crew Workstations, Life Support, and Escape	15,456	14,407	10,181	10,708	11,453	9,232	9,457	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project improves combat performance, develops rigorous, traceable human-centered design methodologies; protects aircrews from physiological stresses such as high altitude, high G-forces, high temperature, and aerodynamic forces; and reduces aircrew fatalities and major injuries in emergency ejections at high-speed and at low altitude, adverse attitude flight conditions, while improving supportability and accommodating the full range of the pilot population.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 792 Developed and demonstrated technologies for improved protective equipment for aircrew and support personnel. <ul style="list-style-type: none"> - (U) Continued development and demonstration of advanced aircrew oxygen mask technology for high-G and high-altitude operations. - (U) Demonstrated personal protective equipment technology to provide improved protection in hostile environments for female aviators. - (U) Developed and transitioned to the Air Force Information Warfare Center (AFIWC) the Laser Threat Analysis System (LTAS) version 2.0 for eye damage and Night Vision Goggles (NVG) Maverick vulnerability. - (U) Demonstrated compatibility of single-line, visible wavelength laser-eye protection (LEP) with heads up display and aircraft avionics displays. - (U) \$ 1,340 Developed and demonstrated life support technologies for integration into aircraft to improve aircrew safety and reduce logistical burdens. <ul style="list-style-type: none"> - (U) Continued development of advanced hybrid oxygen technologies for aeromedical operations. - (U) Completed laboratory demonstration of personal environmental cooling technology for aircrews. - (U) \$ 1,309 Concluded verification testing and beta testing of human-centered software tools for design and modification of operator stations. <ul style="list-style-type: none"> - (U) Transitioned human-centered evaluation technology to more than fifty sites in DoD and industry. - (U) Concluded field demonstration of crew-centered design and evaluation technology, correlating human performance with mission/system performance in the cockpit. - (U) \$ 438 Conducted human-centered design studies to support advanced distributed simulation. <ul style="list-style-type: none"> - (U) Assessed human performance models to make valid predictions for aircraft ground attack. - (U) Began definition program for a simulation-based combat automation requirements testbed. - (U) Developed analytical techniques to link human measures of performance to system level measures of effectiveness. - (U) \$ 5,453 Developed a demonstrator to evaluate life-saving capabilities of an escape system including technologies derived from the Russian K-36 ejection seat (U.S. - Russian cooperation). 										
Project 2830	Page 3 of 9 Pages					Exhibit R-2 (PE 0603231F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603231F Crew Systems & Personnel Protection Technology	2830
<ul style="list-style-type: none"> - (U) Established ejection seat performance baseline. - (U) Conducted preliminary design studies of the demonstration system. - (U) Designed demonstration system for accommodation of the expanded aircrew population. - (U) Fabricated and delivered two prototype demonstrator ejection seats. - (U) \$ 2,582 Demonstrated controlled ejection seat flight from high-speed and from adverse ejection attitudes. - (U) Completed high-speed/adverse-attitude ejection seat testing. - (U) \$ 3,542 Analyzed data and documented escape system technology demonstration program results. - (U) Developed technologies to address small occupant requirements for current operational ejection seats. - (U) Tested existing Air Force/Navy/Marine Corps front-line trainer and tactical aircraft ejection seats with lightweight crew members to verify their predicted performance and identify problems. - (U) Designed and tested technology to upgrade existing ejection seats to accommodate small occupants. - (U) Demonstrated accommodation of lower weight female crew members. - (U) \$15,456 Total 		
(U) FY 1998 (\$ in Thousands):		
- (U) \$ 276	Continue to develop and demonstrate technologies for improved protective equipment for aircrew and support personnel.	
- (U) \$ 1,472	<ul style="list-style-type: none"> - (U) Complete development and demonstrate advanced oxygen mask technology for high-G and high-altitude operations. - (U) Develop and demonstrate life support technologies for integration into aircraft to improve aircrew safety and reduce logistical burdens. - (U) Demonstrate advanced hybrid oxygen technologies for aeromedical operations. - (U) Initiate development of technologies, allowing replacement of current liquid oxygen systems for transport aircrews. 	
- (U) \$ 1,514	<ul style="list-style-type: none"> - (U) Develop and demonstrate human-centered design and evaluation of technologies to support advanced distributed simulation. - (U) Complete functional analysis of crew tasks and information flow for distributed simulation of defense suppression mission. - (U) Determine feasibility of adding crew behavioral model to engagement-level constructive simulation. - (U) Continue planning for a simulation-based combat automation requirements testbed. 	
- (U) \$ 4,304	<ul style="list-style-type: none"> - (U) Demonstrate advanced escape technologies incorporating Russian technology. - (U) Fabricate demonstration ejection seats for adverse attitude/high-speed ejection seat tests. - (U) Conduct ejection seat tests to demonstrate seat performance and life saving capacity. - (U) Analyze data and document lightweight ejection seat demonstration program results. 	
- (U) \$ 4,574	<ul style="list-style-type: none"> - (U) Reduce the technical risks associated with adapting the lightweight Russian ejection seat technologies to U.S. aircraft. - (U) Assess ejection seat interfaces with aircraft cockpits. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603231F Crew Systems & Personnel Protection Technology	2830
<ul style="list-style-type: none"> - (U) \$ 2,267 - Verify compatibility with current Air Force/Navy personal equipment. - (U) Explore low-cost ballistic cartridges and propulsion systems as a joint effort with the U.S. Navy. - (U) Analyze life cycle and logistics support concept improvements. - (U) Define manufacturing concepts and technologies for production in the U.S. - (U) \$ 2,267 Demonstrate technologies to address small occupant requirements for current ejection seats. - (U) Demonstrate controlled propulsion technology as an upgrade to existing ejection seats to safely eject the expanded aircrew population. - (U) Evaluate alternative technology enhancements to accommodate the expanded aircrew population in current tactical aircraft. - (U) \$14,407 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 1,847 Develop a simulation testbed for evaluating weapon systems automation requirements in terms relating crew performance to mission outcome. <ul style="list-style-type: none"> - (U) Define a process to quantify crew performance requirements and to base automation design on crew performance data. - (U) Establish the testbed concept of operation for use during system development and show that crew performance data extracted from combat simulation can verify design decisions. - (U) Begin developing a human performance model to inter-relate crew task performance with combat mission outcome via engagement simulation. - (U) \$ 2,500 Integrate and demonstrate subsystems to protect the aircrew member during emergency ejections. <ul style="list-style-type: none"> - (U) Build integrated design of a passive head/neck protection subsystem onto existing ejection seat high-speed escape. - (U) Test design of command inertial haulback reel for restraint during escape and during in-flight maneuvering. - (U) Develop an ejection seat insert which combines proven technologies for enhanced comfort, improved impact, and vibration response and is adaptable to current Air Force/Navy ejection seats. - (U) \$ 3,200 Demonstrate improved aircraft emergency escape in existing trainer aircraft. <ul style="list-style-type: none"> - (U) Demonstrate the feasibility of adding escape system capability to the T-3 aircraft currently possessing bail-out only capability. - (U) Investigate improved ejection seat in T-38 trainer aircraft for full aircrew accommodation. - (U) \$ 634 Develop ejection seat evaluation capabilities for high-speed escape. <ul style="list-style-type: none"> - (U) Develop and demonstrate instrumentation suites for measurement of aerodynamic and inertial loads acting on a crewmember during emergency aircraft ejection to develop crewmember protection and ejection seat rocket motor design criteria. - (U) \$ 2,000 Continue to develop and demonstrate life support technologies for integration into aircraft to improve aircrew safety and reduce logistical burden. 		
Project 2830	Page 5 of 9 Pages	Exhibit R-2 (PE 0603231F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603231F Crew Systems & Personnel Protection Technology	PROJECT 2830		
<p>– (U) Continue development of technologies to eliminate limits and logistics problems of existing oxygen systems on heavy aircraft.</p> <p>– (U) \$10,181 Total</p>				
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
(U) Previous President's Budget (FY 1998 PB)	14,696	9,967	12,129	Cost
(U) Current Budget Submit/FY 1999 PB	15,456	14,407	10,181	Cont
(U) Change Summary Explanation:				
Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
– (U) PE 0602202F, Armstrong Lab Exploratory Development.				
– (U) PE 0604703F, Aeromedical/Casualty Care Systems Development.				
– (U) PE 0604706F, Life Support Systems.				
– (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
<p>Project 2830</p> <p align="center"><i>Page 6 of 9 Pages</i></p> <p align="right">Exhibit R-2 (PE 0603231F)</p>				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603231F Crew Systems & Personnel Protection Technology				PROJECT 3257				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3257 Helmet-Mounted Sensory Technologies				6,735	10,474	6,422	6,648	6,814	6,630	6,808	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: This project develops and demonstrates advanced helmet-mounted subsystem technologies to improve mission effectiveness and pilot situational awareness during day and night missions in all-weather conditions. Through the development of advanced helmet-mounted tracker and display technologies (HMT/D), pilots will be able to detect, identify, target, and launch weapons faster and more accurately. This project also develops technology for improved night vision goggles (NVG) to enhance combat capabilities at night.</p> <p>(U) FY 1997 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$ 5,069 Developed and demonstrated Helmet Vehicle Interface (HVI) and subsystems technologies for HMT/D. <ul style="list-style-type: none"> - (U) Developed design for new HMT/D with color symbology display. - (U) Demonstrated advanced HMT/D on two operational fighters and transitioned to the Air Force/Navy Joint Helmet-Mounted Cueing System (JHMCS). - (U) Evaluated advanced HVI designs. - (U) Continued evaluation of anthropometric technology issues for fit of HMT/D on full pilot population. - (U) \$ 1,431 Developed and demonstrated advanced night vision technologies for DoD aircrew requirements. <ul style="list-style-type: none"> - (U) Evaluated improved NVG technologies. - (U) Developed new image intensifier tube technology for NVG. - (U) Demonstrated concept for panoramic NVG with expanded field-of-view. - (U) \$ 235 Evaluated windscreen and canopy transparency distortions. <ul style="list-style-type: none"> - (U) Measured F-15 and F-16 transparencies for JHMCS program office. - (U) Developed initial compensation polynomial to correct transparency distortions for HMT/Ds. - (U) \$ 6,735 Total <p>(U) FY 1998 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$ 3,321 Continue to develop and demonstrate HMT/D and subsystem technologies. <ul style="list-style-type: none"> - (U) Demonstrate HMT/D with color symbology display in simulator. - (U) Assess component improvements for HMT/Ds for fighters. - (U) Evaluate eye tracker technologies for use in flight-qualified oculometer. 												
Project 3257				Page 7 of 9 Pages				Exhibit R-2 (PE 0603231F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603231F Crew Systems & Personnel Protection Technology	
		PROJECT 3257
– (U) \$ 1,543	<ul style="list-style-type: none"> – (U) Continue evaluation of anthropometric technology issues for fit of HMT/D on full pilot population. Develop and demonstrate advanced laser eye protection (LEP) technologies and laser susceptibility models. – (U) Deliver Laser Threat Analysis System (LTAS) version 2.0 incorporating air-to-ground threats in Dynamic three-dimensional Fly-by-Animation. – (U) Initiate early operational assessment of single-line, visible wavelength LEP in various aircraft. – (U) Complete flight assessment of dielectric stack technology in F-15E and F-117 aircraft. – (U) Expand flight test of dielectric stack technology to include C-17 and AC-130 aircraft. – (U) Develop and evaluate Airborne Laser (ABL) protection technologies. 	
– (U) \$ 2,610	<ul style="list-style-type: none"> Continue to develop and demonstrate advanced night vision technologies for DoD aircrew requirements. – (U) Demonstrate panoramic night vision goggles (NVG) with dynamic symbology overlay. – (U) Assess improved image intensifier tube technology for NVGs. 	
– (U) \$ 3,000	<ul style="list-style-type: none"> Develop miniature flat-panel image source for helmet-mounted tracker and displays (HMT/Ds). – (U) Demonstrate high resolution monochrome image source at high luminance levels. – (U) Assess potential of miniature flat-panel image source for helmet-mounted tracker and display technologies (HMT/D) applications. 	
– (U) \$10,474	Total	
(U) FY 1999 (\$ in Thousands):		
– (U) \$2,877	<ul style="list-style-type: none"> Continue to develop and demonstrate HMT/D and subsystem technologies. – (U) Demonstrate HMT/D with color symbology display in aircraft. – (U) Assess component improvements for HMT/Ds for fighters. – (U) Continue to evaluate eye tracker technologies for use in flight-qualified oculometer. – (U) Continue evaluation of anthropometric technology issues for fit of HMT/D on full pilot population. 	
– (U) \$1,283	<ul style="list-style-type: none"> Develop and demonstrate advanced laser eye protection (LEP) technologies and susceptibility models. – (U) Initial phase of integrating Laser Threat Analysis System (LTAS) into the Distributed Interactive Simulation (DIS) as the Directed Energy Warfare (DEW) server for laser and broadband optical threats. – (U) Develop and validate reflectivity analysis tool to evaluate the hazards of high energy laser systems. – (U) Continue flight tests of dielectric stack technology to include C-17 and AC-130 aircraft. 	
– (U) \$2,262	<ul style="list-style-type: none"> Continue to develop and demonstrate advanced night vision technologies for DoD aircrew requirements. – (U) Demonstrate Panoramic Night Vision Goggles (PNVG) with imagery overlay. 	
– (U) \$6,422	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603231F Crew Systems & Personnel Protection Technology	PROJECT 3257																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;">Total</th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">6,746</td> <td style="text-align: center;">7,237</td> <td style="text-align: center;">5,837</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">6,735</td> <td style="text-align: center;">10,474</td> <td style="text-align: center;">6,422</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to increased emphasis on laser eye protection (LEP) technologies within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602202F, Armstrong Lab Exploratory Development. - (U) PE 0603238F, Global Surveillance and Communications. - (U) PE 0604706F, Life Support Systems. - (U) PE 0604201F, Common Avionics Planning/Development. - (U) PE 0207130F, F-15 Squadrons. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total	(U) Previous President's Budget (FY 1998 PB)	6,746	7,237	5,837	Cont	(U) Current Budget Submit/FY 1999 PB	6,735	10,474	6,422	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total														
(U) Previous President's Budget (FY 1998 PB)	6,746	7,237	5,837	Cont														
(U) Current Budget Submit/FY 1999 PB	6,735	10,474	6,422	Cont														
Project 3257	Page 9 of 9 Pages	Exhibit R-2 (PE 0603231F)																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603245F Flight Vehicle Technology Integration	PROJECT 2568
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2568 Flight Vehicle Technology Integration	5,948	6,062	7,674	8,807	10,884	10,133	10,674	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program integrates and demonstrates advanced flight vehicle technologies that will improve the performance and supportability of existing and future aircraft. System level integration brings together the air vehicle technologies along with avionics, propulsion, and weapon systems to flight demonstrate them in a near-realistic operational environment. Integration and flight test demonstrations reduce the risk and time required to transition technologies into operational aircraft. This program provides proven flight vehicle technologies for all-weather, day or night operations, and technologies for improved affordability. Note: In FYs 1999 and out, additional emphasis has been placed on analyzing the flight control forces and moments of the Variable Stability In-flight Simulation Test Aircraft (VISTA). FY 1997 and FY 1998 Congressional adds for VISTA were executed in PE 0604237.

(U) FY 1997 (\$ in Thousands):

- (U) \$1,086 Developed and demonstrated advanced aeromechanics and flight control technologies for evaluation of increased combat effectiveness.
 - (U) Flight-tested high-authority propulsion flight control systems for demonstration of increased range, elimination of loss of control, and improved supersonic maneuvering up to Mach 2.0.
- (U) \$3,739 Developed and demonstrated advanced subsystem technologies and technology integration for evaluation of increased supportability and combat effectiveness.
 - (U) Completed aircraft modification for long-life, all-envelope, integrated flight and propulsion control subsystem for VISTA to evaluate impact of advanced maneuvering capabilities for air-to-air and air-to-ground combat.
 - (U) Completed installation and integration flight testing of programmable head-up display and helmet-mounted display capabilities.
- (U) \$1,123 Performed static and sub-scale testing of three next-generation nozzle concepts to determine fluidic control effectiveness in improving stealthiness and performance while simplifying design.
- (U) \$5,948 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603245F Flight Vehicle Technology Integration	PROJECT 2568
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,364 Develop, integrat, and demonstrat advanced aeromechanics, propulsion, and flight control technologies for increasing combat effectiveness. <ul style="list-style-type: none"> - (U) Modified the high-authority propulsion flight control systems to remove vertical tail surface area for demonstration of increased range, elimination of loss of control accidents, and improved supersonic maneuvering. - (U) Completed detailed design and initiate fabrication of selected critical components required for next generation simplified nozzle and airframe structural integration. - (U) \$555 Initiate development of control strategies to extend range, ensure safe operation, and allow precision close operations of mixed manned and unmanned aircraft. - (U) \$3,143 Develop, integrate, and demonstrate advanced subsystem technologies and technology integration for evaluation of significant improvement in air-to-air combat effectiveness. <ul style="list-style-type: none"> - (U) Completed detailed design and initiate fabrication of aircraft structural component for demonstration, with significant increase in survivability of existing military aircraft. - (U) Developed methodology to analyze the effect of unique control forces and moments on the structural integrity of the Variable Stability In-flight Simulation Test Aircraft (VISTA). - (U) \$6,062 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,543 Develop, integrate, and demonstrate advanced aeromechanics, propulsion, and flight control technologies for increasing combat effectiveness. <ul style="list-style-type: none"> - (U) Complete fabrication of selected next-generation flow control exhaust nozzle and airframe structural critical components. - (U) \$964 Complete development and flight-test control strategies to extend range, ensure safe operation, and allow precision close operations of mixed manned and unmanned aircraft. - (U) \$4,167 Develop, integrate, and demonstrate advanced subsystem technologies and technology integration for evaluation of significant improvement in air-to-air combat effectiveness. <ul style="list-style-type: none"> - (U) Complete development of methodology to analyze the effect of unique control forces and moments on VISTA's structural integrity. - (U) Develop flight-test units of electric actuator stabilators for reducing weight while increasing affordability of control actuators. - (U) Develop concept for demonstration of integrated aerodynamic, structural, subsystem, flight control, propulsion, materials, and manufacturing technologies as they focus against the UCAV mission. - (U) \$7,674 Total 		
Project 2568	Page 2 of 3 Pages	Exhibit R-2 (PE 0603245F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603245F Flight Vehicle Technology Integration			PROJECT 2568
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	6,132	7,795	9,828	Cont
(U) Appropriated Value	6,423	6,423		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-135	-210		
b. SBIR	-156	-151		
c. Omnibus/Other Above Threshold Reprogrammings	-24			
d. Below Threshold Reprogrammings	-150			Cont
e. Rescissions	-10			
(U) Adjustments to Budget Year Since FY1998 PB			-2,154	
(U) Current Budget Submit/FY 1999 PB	5,948	6,062	7,674	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
- (U) PE 0603106F, Logistics Systems Technology.				
- (U) PE 0603205F, Flight Vehicle Technology.				
- (U) PE 0603211F, Aerospace Structures.				
- (U) PE 0604237F, Variable Stability In-Flight Simulation Test Aircraft.				
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
Project 2568 Page 3 of 3 Pages Exhibit R-2 (PE 0603245F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603253F Advanced Avionics Integration
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	14,107	12,012	10,536	8,747	10,796	10,660	10,992	Continuing	Continuing
2735 Avionics Integration Technology	6,095	5,783	6,016	5,217	5,510	5,437	5,620	Continuing	Continuing
3833 Integrated Avionics for Aging Aircraft	3,176	2,387	0	0	0	0	0	Continuing	Continuing
666A Reference and Information Transmission Technology	4,836	3,842	4,520	3,530	5,286	5,223	5,372	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: In FYs 1999 and out, Project 3833 transferred into Project 2735.

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program develops and demonstrates aircraft communications, navigation, identification, and cockpit display integration technologies and techniques for improved aircraft performance, reduced pilot workload, and reduced avionics support costs. This program develops and improves: advanced solid state inertial guidance units and Global Positioning System receivers; technologies for low probability of detection communications between aircraft to improve aircrew situation awareness; highly reliable and maintainable avionics architectures and advanced processors; integration techniques to reduce aircraft electronic emissions to improve aircraft hostile airspace penetration capability; and affordable avionics technologies to extend the life of aging aircraft.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603253F Advanced Avionics Integration
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	14,809	12,716	14,218	Cont
(U) Appropriated Value	15,488	12,716		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-328	-422		
b. SBIR	-351	-282		
c. Omnibus/Other Above Threshold Reprogrammings	-675			
d. Below Threshold Reprogrammings	-3			
e. Rescissions	-24			
(U) Adjustments to Budget Year Since FY 1998 PB			-3,682	
(U) Current Budget Submit/FY 1999 PB	14,107	12,012	10,536	Cont

(U) **Change Summary Explanation:**

Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:** Not Applicable.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603253F Advanced Avionics Integration				PROJECT 2735	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2735 Avionics Integration Technology	6,095	5,783	6,016	5,217	5,510	5,437	5,620	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: Develops and demonstrates technologies that provide for robust implementation and exploitation of offensive and defensive sensors; reduced avionics support costs, weight, and volume; and improved reliability. These advanced technologies provide the avionics integration capability that enables improved cockpit systems management, information display, and weapons targeting and tracking and includes integrated avionics architectures, information integration involving on-board and off-board sensors, and sensor management technologies.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,225 Develop advanced modular, sharable radio frequency (RF) sensor processing technologies to provide for avionics cost and weight savings, improved reliability, and increased sensor data fusion opportunities. Modularity allows for retrofits that reduce avionics support costs. <ul style="list-style-type: none"> - (U) Fabricated integrated sensor system module types and unit test the embedded application and control software. - (U) \$972 Develop advanced sensor integration technologies and algorithms to provide the capability to augment the performance of individual sensors which will enable improved fault tolerance and situation awareness. <ul style="list-style-type: none"> - (U) Developed and demonstrated affordable, improved anti-jam filter/adaptive aircraft antenna electronics. - (U) \$1,898 Develop integrated avionics architecture components which leverage prior technology demonstration developments and incorporate additional user requirements for multi-platform commonality, open system architecture compliance, standard high-level software language, affordability, and expandability features. <ul style="list-style-type: none"> - (U) Developed high performance, three-dimensional terrain/threat avoidance display generation technology for the low-level avionics mission environment. - (U) \$6,095 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,941 Develop and demonstrate advanced modular, sharable RF sensor processing technologies to provide for avionics cost and weight savings, improved reliability, and increased sensor data fusion opportunities. Modularity will allow for retrofits that reduce avionics support costs. <ul style="list-style-type: none"> - (U) Integrate components and perform laboratory demonstration of an integrated sensor system which simultaneously performs radar, electronics warfare, communication, navigation, and identification functions. 									
Project 2735	Page 3 of 12 Pages				Exhibit R-2 (PE 0603253F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603253F Advanced Avionics Integration	2735
<ul style="list-style-type: none"> - (U) \$1,228 Develop integrated avionics architecture components which leverage prior technology developments and incorporate additional user requirements for multi-platform commonality, open system architecture compliance, standard high-level software language, affordability, and expandability. <ul style="list-style-type: none"> - (U) Flight demonstrate a low-level covert penetration capability using common/open system processing hardware and a portable real-time Ada operating system in a simulated threat environment; analyze cost/performance benefits of this capability for special operations aircraft mission rehearsals. - (U) Demonstrate improved threat location using off-board intelligence data integrated with on-board sensor information to improve low-level covert penetration capability for special operations aircraft. - (U) \$614 Develop architectural components required to convert radio frequency (RF) functions (radar, electronic warfare, communications) from bulky, analog electronics to more compact, reliable digital technology. Applicable to future and aging aircraft, all-digital RF technology will provide significant cost/performance payoffs via commonality across RF subsystems. <ul style="list-style-type: none"> - (U) Develop preliminary architectural framework and assess leveraging opportunities in commercial developments. - (U) \$5,783 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,816 Develop and demonstrate advanced modular, sharable RF sensor technologies to provide for avionics cost and weight savings, improved reliability, and increased sensor data fusion opportunities. Highly reliable, modular building blocks will enable multi-mission use with reduce combat support assets. <ul style="list-style-type: none"> - (U) Perform integration and application specific demonstrations to ease transition of integrated sensor system technology to currently fielded as well as future systems. - (U) Develop RF adaptive processing techniques to support the mitigation of clutter and jamming and enhance advanced target detection and track from long-range standoff airborne, space-based, and reconnaissance platforms. - (U) \$1,000 Develop technologies that allow the collection and integration of sensor data from various sources in a collaborative engineering environment in order to reduce risks and costs of advanced technology demonstration and to enable faster transition of affordable technology to meet warfighter needs. <ul style="list-style-type: none"> - (U) Develop a collaborative engineering capability which links together non-coclocated Air Force resources to provide a comprehensive avionics virtual technology development environment. - (U) Evaluate sensor data in a collaborative engineering environment to determine methods of shortening the timeline for dissemination of information to warfighters. 		
Project 2735	Page 4 of 12 Pages	Exhibit R-2 (PE 0603253F)

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603253F Advanced Avionics Integration	PROJECT 2735
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	6,682	6,125	6,062	Cont
(U) Current Budget Submit/FY 1999 PB	6,095	5,783	6,016	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0603204F, Aerospace Avionics.
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0603270F, Electronic Warfare Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603253F Advanced Avionics Integration	PROJECT 3833
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3833 Integrated Avionics for Aging Aircraft	3,176	2,387	0	0	0	0	0	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Develops and demonstrates affordable avionics technology to extend the useful life of Air Force aging aircraft and provide the flexibility and supportability needed to support worldwide operations with reduced force structure. This project focuses on technologies to support transition of modular avionics, commercially available products, and commercial open system standards for cost-effective retrofit of user-required upgrades to existing avionics systems. In FY 1999 and out, this Project transfers to Project 2735.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,384 Develop and demonstrate programmable integrated communications, navigation, and identification hardware/software modules for currently fielded aircraft applications to provide fleet wide commonality, attendant economies of scale, and increased platform availability.
 - (U) Developed and evaluated technology required to maintain data security and integrate modular communications, navigation, and identification components with existing platform-specific interfaces, hardware, software, and backplanes.
- (U) \$792 Develop hardware and software technologies to support re-use of existing avionics software with newly developed Ada software in a common, real-time, embedded core avionics environment and to provide a cost-effective incremental upgrade capability.
 - (U) Developed hardware/software technology necessary for simultaneous execution of existing 16-bit avionics software written in many languages with new 32-bit Ada application and control software to reduce the life cycle cost of upgrading and adding software to existing weapon systems.
- (U) \$3,176 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$404 Develop and demonstrate programmable integrated communications, navigation, and identification hardware/software modules for currently fielded aircraft applications to provide fleet wide commonality, attendant economies of scale, and increased platform availability.
 - (U) Demonstrate and transition the technology required to integrate modular communications, navigation, and identification components into existing platforms while maintaining data security.
- (U) \$1,377 Develop and demonstrate technologies to support maximum use of existing avionics software in concert with newly developed software in a real-time avionics environment and, thereby, provide a cost-effective incremental upgrade capability. (In FY 1999, these efforts will transfer to Project 2735, Avionics Integration Technology.)
 - (U) Continue development of technology necessary for simultaneous execution of existing 16-bit avionics software written in many languages with new 32-bit Ada application software to reduce the life cycle cost of upgrading and maintaining existing weapon systems.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603253F Advanced Avionics Integration	3833
<p>– (U) \$606 Develop avionics integration technologies to enable commercial-off-the-shelf components to function reliably in a combat aircraft environment for cost-effective modernization of aging avionics.</p> <ul style="list-style-type: none">– (U) Determine feasibility of inserting commercial products into an avionics open system architecture.– (U) Define candidate open system interfaces to enable competitive development for architectural components.– (U) Establish a collaborative engineering capability which links together non-colocated Air Force resources to provide a comprehensive virtual environment for avionics development, eliminating the need for expensive and duplicative hardware and facilities. <p>– (U) \$2,387 Total</p> <p>(U) <u>FY 1999</u>: Not Applicable.</p>		
Project 3833	Page 8 of 12 Pages	Exhibit R-2 (PE 0603253F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603253F Advanced Avionics Integration	PROJECT 3833															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">3,268</td> <td style="text-align: center;">2,526</td> <td style="text-align: center;">3,227</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">3,176</td> <td style="text-align: center;">2,387</td> <td style="text-align: center;">0</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602204F, Aerospace Avionics. - (U) PE 0602301E, Intelligence System Program. - (U) PE 0602232N, Navy Command, Control, and Communications (C3) Technology. - (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles. - (U) PE 0604201F, Common Avionics. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	3,268	2,526	3,227	Cont	(U) Current Budget Submit/FY 1999 PB	3,176	2,387	0	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>													
(U) Previous President's Budget (FY 1998 PB)	3,268	2,526	3,227	Cont													
(U) Current Budget Submit/FY 1999 PB	3,176	2,387	0	Cont													
Project 3833	Page 9 of 12 Pages	Exhibit R-2 (PE 0603253F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603253F Advanced Avionics Integration				PROJECT 666A				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
666A Reference and Information Transmission Technology				4,836	3,842	4,520	3,530	5,286	5,223	5,372	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Develops and demonstrates advanced, high-speed reference and information transmission technologies and techniques to improve overall aircrew situation awareness. These technologies will also reduce the electromagnetic signatures of navigation and communications systems, increasing aircraft survivability. The focus is on incorporating jam-resistant, low probability of detection transceivers, inertial components, navigation systems technology and techniques into air vehicles and on developing techniques for exploiting the capabilities of the Global Positioning System (GPS) to provide highly accurate reference information. Technologies demonstrated under this project are needed for real-time information in the cockpit, stealth operations, precision targeting and strike, timely bomb damage assessment, force multiplication through multi-platform shared resources, and affordable/supportable weapon systems.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$925 Develop advanced inertial reference technology and architectures to improve robustness of reference functions and accuracy of weapon/sensor boresights. <ul style="list-style-type: none"> - (U) Integrated techniques and planned flight experiments for dynamic airframe flexure compensation and navigation fault detection/isolation to meet precision targeting and weapon delivery requirements. - (U) \$1,069 Develop enhancements to GPS user equipment and system integration techniques to maximize position accuracy and jam resistance and exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced costs. <ul style="list-style-type: none"> - (U) Completed ground experiments and initiate flight experiments of GPS-based techniques to rapidly locate and then counter enemy emitters for an enhanced, low-cost suppression of enemy air defenses capability for tactical fighters. - (U) \$2,842 Develop multi-user, medium to high capacity, jam-resistant airborne network to provide for low probability of detection exchange of time-critical threat, sensor, and cooperative operations information between aircraft. <ul style="list-style-type: none"> - (U) Completed fabrication and demonstration of technology for high-speed, high-bandwidth data transfer capability for secondary dissemination of reconnaissance/intelligence data and imagery to support real-time precision targeting and strike. - (U) \$4,836 Total 												
Project 666A				Page 10 of 12 Pages				Exhibit R-2 (PE 0603253F)				

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603253F Advanced Avionics Integration	PROJECT 666A
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,435 Develop enhancements to Global Positioning System (GPS) user equipment and system integration techniques to maximize position accuracy and jam resistance and exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced costs. <ul style="list-style-type: none"> - (U) Complete flight experiments of GPS-based techniques to rapidly locate and then counter enemy emitters for an enhanced, low-cost suppression of enemy air defenses capability for tactical fighters. - (U) Develop optimum anti-jam techniques to fully exploit all-digital GPS user equipment architectures. - (U) Develop techniques for more accurate precision attack using anti-jam, all-digital GPS user equipment and improved GPS signals. - (U) \$1,407 Develop multi-user, medium to high capacity, jam-resistant airborne network technology to provide for low probability of detection exchange of time-critical threat, sensor, and other information between aircraft and cooperative assets. <ul style="list-style-type: none"> - (U) Complete brassboard design for a low-cost, real-time adaptive, jam-resistant voice and data transfer suite. - (U) Complete ground-testing of technology for high-speed, high-bandwidth data transfer capability for secondary dissemination of reconnaissance/intelligence data and imagery to support real-time precision targeting. - (U) \$3,842 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,600 Develop enhancements to GPS user equipment and system integration techniques to maximize position accuracy and jam resistance and exploit the benefits of GPS to improve offensive and defensive combat capabilities at reduced costs. <ul style="list-style-type: none"> - (U) Continue to develop anti-jam techniques to fully exploit all-digital GPS user equipment architectures. - (U) Continue to develop techniques to provide higher accuracy for precision attack using anti-jam, all-digital GPS user equipment and improved GPS signals. - (U) \$1,920 Develop multi-user, medium to high capacity, jam-resistant airborne network technology to provide for low probability of detection exchange of time-critical threat, sensor, and other information between aircraft and cooperative assets. <ul style="list-style-type: none"> - (U) Develop a common, affordable, open system architecture for unmanned aerial vehicles, using commercial standards and interfaces, to reduce avionics costs and improve supportability. - (U) Develop dual-use brassboard featuring space-based communication and positioning for use by both tactical fighters and business aircraft to meet new federal and international air traffic control standards. - (U) \$4,520 Total 		
Project 666A	Page 11 of 12 Pages	Exhibit R-2 (PE 0603253F)

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	26,133	32,540	25,553	26,533	27,486	27,721	28,415	Continuing	Continuing
2432 Defensive System Fusion Technology	7,536	5,800	7,171	6,988	6,398	7,728	8,328	Continuing	Continuing
431G Radio Frequency (RF) Warning and Countermeasures	5,547	12,931	9,215	8,656	7,785	8,874	8,968	Continuing	Continuing
691X Electro-Optical/Infrared (EO/IR) Warning and Countermeasures	13,050	13,809	9,167	10,889	13,303	11,119	11,119	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: In FYs 1998 and out, several projects in this PE have been combined and/or reorganized. Project 2754, Suppression of Enemy Air Defenses, and the former Project 2432, Defensive System Fusion, have been consolidated within Project 2432, Defensive System Fusion Technology. The radio frequency countermeasures efforts from the former Project 691X, On-board Countermeasures, have moved into Project 431G, Radio Frequency Warning and Countermeasures. Project 2222, Expendable Countermeasures, and the infrared missile warning efforts from the former Project 431G, Threat Alert, have been combined within Project 691X, Electro-Optical/Infrared (EO/IR) Warning and Countermeasures. In addition, precision location and identification efforts (conducted until FY 1997 in the former Project 2432, Defensive System Fusion) are now reported as part of Project 431G, Radio Frequency Warning and Countermeasures. For clarity, FY 1997 portions of this exhibit have used the new project structure.

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program expands the EC technology base by proving design concepts and demonstrating technologies to support critical Air Force EC requirements. The projects are categorized by the development of components, subsystems, and technologies that have potential application to satisfy combat, special operations, and airlift EC requirements and to reduce acquisition and life cycle costs of EC systems. The program develops and demonstrates: radio frequency; infrared; electro-optic; and command, control, and communications countermeasure technologies. Technology demonstrations include flyable brassboards against validated threat simulators. In addition, the program develops and demonstrates technologies and concepts for signature reduction, advanced electronic warfare transmitters, receivers, and power management. This program ensures a strong EC technology base to provide demonstrated counters to current and future threat capabilities. Note: In FY 1998, Congress added \$3.75M for Closed-Loop Infrared Countermeasures technology and \$5.0 M for Precision Location and Identification technologies.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	26,414	25,621	26,765	Cont
(U) Appropriated Value	27,602	34,371		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-577	-1,125		
b. SBIR	-611	-706		
c. Omnibus/Other Above Threshold Reprogrammings	-1,063			
d. Below Threshold Reprogrammings	782			
E. Rescissions				
(U) Adjustments to Budget Year Since FY1998 PB			-1,212	
(U) Current Budget Submit/FY 1999 PB	26,133	32,540	25,553	Cont

(U) Change Summary Explanation:

Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program. Below threshold reprogramming was for advanced decoy development.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary: Not Applicable.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology	PROJECT 2432
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2432 Defensive System Fusion Technology	7,536	5,800	7,171	6,988	6,398	7,728	8,328	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification:** This project develops and demonstrates techniques and technologies for sensor and system fusion and integration. It also develops the advanced algorithms and assessment techniques necessary to cope with the projected multi-spectral threat and countermeasure environments for combat aircraft. Transferred from Project 2754 are those technology efforts required for command and control warfare, standoff jamming, and support countermeasures for denial, disruption, and suppression of adversary air defense operations. Included in these are: 1) advanced components and techniques needed to jam enemy radar; 2) novel electronic collection methods to inform the field commander of changes in the electronic environment; and 3) advanced standoff jammer technologies.

(U) FY 1997 (\$ in Thousands):

- (U) \$5,195 Develop technology to demonstrate low-cost (based on commercial processors and open architecture), off-board and on-board threat sensor fusion for situation awareness that meets needs for both new and existing aircraft.
- (U) Conducted preliminary flight demonstrations for hardware and software optimization of off-board and on-board threat sensor fusion technology.
- (U) Optimized hardware and algorithms/software in preparation for final demonstration of sensor fusion technology model.
- (U) \$2,341 Develop and investigate techniques to suppress adversary defense command and control networks.
- (U) Completed demonstrations of techniques to counter specific types of command and control warfare signals.
- (U) Completed development and demonstration of an approach to counter airborne navigation aids.
- (U) Fabricated and integrate components (based on new commercial technology) to demonstrate techniques to counter threat command and control processing nets/nodes.
- (U) Design and analyze advanced techniques for countering airborne navigation systems.
- (U) \$7,536 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$2,897 Develop low-cost (based on commercial processors and open architecture) technologies to demonstrate fusion of data (e.g., threat, targeting, command and control, etc.) from off-board and on-board sensors to enhance situation awareness in both new and existing aircraft.
- (U) Conduct hardware in loop demonstration of optimized sensor fusion technology within the existing avionics size, weight, and power constraints of a tactical aircraft.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603270F Electronic Combat (EC) Technology	2432
<ul style="list-style-type: none"> - (U) \$2,379 Develop and investigate command and control warfare electronic attack (EA) techniques to suppress and counter adversary command and control networks. <ul style="list-style-type: none"> - (U) Complete critical hardware/software designs; initiate fabrication of components for jamming modern digital command and control network links. - (U) Complete preliminary designs of EA techniques to counter advanced navigation systems. - (U) \$524 Develop and evaluate advanced defensive techniques based on fusion of multiple information sources including defensive sensors, offensive sensors, off-board broadcast information, off-board data links, and cooperative off-board sensors. <ul style="list-style-type: none"> - (U) Complete preliminary design of a combat information system that integrates defensive avionics functions. - (U) \$5,800 Total 		
(U) FY 1999 (\$ in Thousands):		
<ul style="list-style-type: none"> - (U) \$1,578 Develop low-cost (based on commercial processors and open architecture) technologies to demonstrate fusion of data (e.g., threat, targeting, command and control, etc.) from off-board and on-board sensors to enhance situation awareness in both new and existing aircraft. <ul style="list-style-type: none"> - (U) Optimize final Ada code for sensor fusion technology model for multiple platforms. - (U) Complete preliminary design trade offs for candidate techniques and algorithms via commercial technology architectures. - (U) \$5,593 Develop and investigate command and control warfare EA techniques to suppress and counter adversary command and control networks. <ul style="list-style-type: none"> - (U) Complete hardware/software integration of brassboard demonstration model and conduct ground/field testing against modern digital command and control network links. - (U) Complete fabrication of preliminary EA demonstration model hardware; prepare ground/flight test parameters for demonstration against advanced telemetry links. - (U) Demonstrate laboratory EA technique to counter communications network nodes. - (U) \$7,171 Total 		

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology	PROJECT 2432
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	7,702	6,222	7,315	Cont
(U) Current Budget Submit/FY 1999 PB	7,536	5,800	7,171	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0604270F, Electronic Warfare (EW) Development.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology				PROJECT 431G				
<i>COST (\$ In Thousands)</i>				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
431G Radio Frequency (RF) Warning and Countermeasures				5,547	12,931	9,215	8,656	7,785	8,874	8,968	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops and demonstrates advanced technologies for radio frequency (RF) electronic countermeasures (ECM) suites to enhance survivability of air and space vehicles and to provide crew situation awareness. One major technology area addressed covers missile/aircraft warning, radar frequency receiver technologies, EC preprocessor technologies, advanced sorting/preprocessing algorithms, and expert software for applications on existing and future EC systems. Another technology area focuses on the development and demonstration of systems and components for generating the on-board/off-board RF countermeasure techniques. This includes the development of ECM techniques and as well as advanced ECM technologies such as antennas, power amplifiers, preamplifiers, etc. Note: In FY 1998, Congress added \$5.0 M for Precision Location and Identification technologies.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$644 Conduct risk reduction efforts for low-cost advanced radar and other RF emitters, and infrared (IR) warning concepts and techniques. <ul style="list-style-type: none"> - (U) Defined performance requirements for an advanced radar warning receiver operating in a complex RF environment. - (U) Developed design concepts for a digital RF receiver (cooperative effort with Navy). - (U) \$169 Developed algorithms which provide aircraft defensive systems with threat missile time-to-intercept data using sensor information from a passive, on-board IR missile warning receiver. - (U) \$2,897 Develop aircraft RF self-protection technology to counter the advanced RF threats associated with air defense weapon systems expected to be deployed over the next ten years. <ul style="list-style-type: none"> - (U) Continued cooperative efforts with the other Services and other countries to conduct tests to evaluate various RF countermeasure algorithm and/or hardware solutions. - (U) Identified promising solutions and design/fabricate technology to demonstrate approaches for countering RF threats. - (U) \$1,837 Develop technology for single aperture precision location and identification of ground and airborne RF emitters. <ul style="list-style-type: none"> - (U) Developed demonstration plans and integrate precision location hardware into technology demonstration aircraft. - (U) Completed flight demonstration of technology for single aperture precision location and identification of ground RF emitters and transition to users. - (U) \$5,547 Total 												
Project 431G				Page 6 of 12 Pages				Exhibit R-2 (PE 0603270F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology	PROJECT 431G
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$2,224	Develop low-cost advanced radar and radio frequency (RF) emitter warning concepts and techniques.	
	– (U) Conduct continuing demonstrations to establish benefits and effectiveness of evolving jam-on-pulse RF receiver technology.	
	– (U) Initiate development of a wideband digital receiver for affordable electronic support measures (ESM) and radar warning receiver (RWR) suites based on PE 0602204F brassboard test.	
	– (U) Complete design for an advanced antenna which improves antenna gain factor by a factor of ten at half the cost of current designs.	
– (U) \$6,649	Develop aircraft self-protection technologies to counter advanced RF threats associated with current and future air defense weapon systems.	
	– (U) Complete preliminary design of critical flight-worthy technology components required to jam monopulse radar systems.	
	– (U) Initiate design trade offs of RF hardware, software, and countermeasure techniques necessary to improve performance of current inventory RF countermeasure suites.	
– (U) \$4,058	Develop technology for multiaperture precision location and identification of ground and airborne RF emitters.	
	– (U) Modify precision location and identification algorithm for use with antenna baselines of slow-moving, large aircraft.	
	– (U) Complete initial design of common radar warning receiver subcomponent to reduce risk of transitioning precision location and identification technology to large aircraft.	
– (U) \$12,931	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$2,868	Develop low-cost advanced radar and RF emitter warning concepts and techniques.	
	– (U) Conduct continuing demonstrations to establish the benefits and effectiveness of evolving jam-on-pulse RF receiver technology.	
	– (U) Complete design and fabricate wideband digital receiver for affordable ESM and RWR suites.	
	– (U) Fabricate an advanced antenna that improves antenna gain by a factor of ten at half the cost of current designs.	
– (U) \$6,347	Develop aircraft self-protection technologies and support jamming technologies to counter advanced RF threats associated with current and future air defense weapon systems.	
	– (U) Develop and demonstrate high risk technology for the monopulse angle jamming integrated electronic countermeasures (ECM) program.	
	– (U) Complete design trade offs necessary for improving current inventory RF countermeasure suite performance through modification of ECM system configurations. Evaluate demonstration models.	
	– (U) Develop steerable high-power array for self-protection and support jamming against high-power threats.	
	– (U) Develop a multifunction, compact, modular ECM jammer.	
– (U) \$9,215	Total	
Project 431G	Page 7 of 12 Pages	Exhibit R-2 (PE 0603270F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology	PROJECT 431G
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	5,773	8,873	10,099	Cont
(U) Current Budget Submit/FY 1999 PB	5,547	12,931	9,215	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) PE 0604270F, Electronic Warfare (EW) Development.
- (U) PE 0604270N, EW Development.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology				PROJECT 691X				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
691X	Electro-Optical/Infrared (EO/IR) Warning and Countermeasures			13,050	13,809	9,167	10,889	13,303	11,119	11,119	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops and demonstrates the advanced warning and countermeasure technologies required to negate electro-optical (EO), infrared (IR), and laser threat systems. The off-board (decoys and expendables) and on-board countermeasure technologies developed provide robust, affordable solutions for protection against IR missiles with autonomous seekers, multi-spectral threats, laser-guided weapons and EO/IR tracking systems used to direct EO/IR/radio frequency (RF) missiles. Countermeasure capability against advanced EO, IR, and laser-guided threats are vital for operational aircraft survival in wartime, peacekeeping, and supply mission environments. Note: In FY 1998, Congress added \$3.75M for Closed-Loop Infrared Countermeasures technology.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$10,705 Develop threat-adaptable, laser-based infrared countermeasure (IRCM) technology for large aircraft to defeat current and future IR missiles in multiple threat scenarios. <ul style="list-style-type: none"> - (U) Continued tower testing of threat-adaptable laser-based IRCM jamming techniques and evaluated their potential to defeat IR missiles in accordance with the joint-Service demonstration plan. - (U) Conducted live fire field demonstration of static, closed-loop IRCM brassboard against air-to-air missiles at White Sands Missile Range's North Obscura Peak. - (U) Developed and demonstrated closed-loop IRCM technologies under laboratory and field conditions necessary for continued risk reduction. - (U) Continued to conduct hardware-in-the-loop tests in-house to analyze threat missile operations, developed countermeasure techniques, and assisted in developing digital models of potential threat seekers. - (U) \$793 Develop laser-based electro-optical (EO)/IRCM technology to defeat advanced day/night vision EO/IR acquisition/tracking sensors on threat air defense weapon systems. <ul style="list-style-type: none"> - (U) Conducted threat analysis, vulnerability studies, and associated experiments to determine optimum countermeasure techniques for threat EO/IR acquisition/tracking sensors. - (U) \$422 Develop IR missile warning technology for product improvement of existing and new aircraft-installed equipment, lowering life cycle costs and improving performance to meet the critical need of detecting advanced, lower signature threats. <ul style="list-style-type: none"> - (U) Completed design for an IR missile warning subsystem which utilizes an advanced IR sensor array that eliminates the expensive cryogenic cooling requirement. - (U) Completed evaluation of a temporal algorithm with a commercial image processor for IR missile warning applications. 												
Project 691X				Page 9 of 12 Pages				Exhibit R-2 (PE 0603270F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603270F Electronic Combat (EC) Technology	691X
<ul style="list-style-type: none"> - (U) \$1,130 Develop integrated multi-spectral countermeasure expendables for infrared (IR) and dual mode (IR/radio frequency (RF)) seeker threats. <ul style="list-style-type: none"> - (U) Completed critical design and fabricated test samples of IR expendables which defeat non-imaging threat missiles. - (U) Analyzed technologies to counter enemy dual mode missile seekers. - (U) \$13,050 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$12,270 Develop on-board threat adaptable, laser-based infrared countermeasure (IRCM) technology and off-board (active decoy) technology to defeat current and future IR missiles in multiple scenarios. <ul style="list-style-type: none"> - (U) Continue tower testing threat adaptable, laser-based jamming codes to defeat specific threat IR missiles in accordance with the joint-Service demonstration plan. - (U) Complete fabrication and integration of brassboard hardware to demonstrate closed-loop, laser-based IRCM for large aircraft. Initiate live fire testing at White Sands aerial cable car facility using closed-loop IRCM testbed. - (U) Continue to conduct hardware-in-the-loop and digital simulation experiments to analyze threat missile operations, develop countermeasure techniques, and assist in developing and refining digital models of potential threat infrared seekers. - (U) Conduct field test demonstration of signature management countermeasures against advanced imaging IR missile seekers. - (U) Develop and fabricate a two-color missile warning sensor to hand off missile detection to the countermeasure subsystem. - (U) Develop miniature pointer-tracker to reduce risk of employment of closed-loop IRCM testbed on a large aircraft. - (U) \$1,069 Develop the laser warning and countermeasure technologies necessary to defeat advanced day/night electro-optical (EO)/IR acquisition/tracking sensors on threat air defense systems. These technologies include on-board and off-board (expendable jammers), EO/laser countermeasures, and precision guided weapon countermeasures. <ul style="list-style-type: none"> - (U) Complete development and laboratory testing of techniques for detection of beamrider missiles. - (U) Complete threat analysis and initiate design of laser-based countermeasure concepts to defeat EO/IR tracking systems used to direct a wide variety of weapons. - (U) Develop non-mechanical beam steering technologies for EO, laser, and IR countermeasures. - (U) Complete threat definition and initiate design of IR/RF decoy concepts to negate multi-mode threat seekers. - (U) \$470 Develop IR missile warning technologies for product improvement of existing and new aircraft-installed equipment. These technologies will lower life cycle costs and improve the performance required to detect advanced, low signature threat missiles. <ul style="list-style-type: none"> - (U) Evaluate uncooled IR focal plane arrays for use in lower-cost passive threat warning devices. - (U) Evaluate commercial image processor for use in running IR threat warning algorithms in real-time. - (U) Design sensors and algorithms for missile warning, situational awareness, and defensive infrared search and track. - (U) \$13,809 Total 		
Project 691X	Page 10 of 12 Pages	Exhibit R-2 (PE 0603270F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603270F Electronic Combat (EC) Technology	PROJECT 691X
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li> – (U) \$6,267 Develop on-board threat adaptable, laser-based infrared countermeasure (IRCM) technology and off-board (active decoy) technology to defeat current and future infrared (IR) missiles in multiple scenarios. <ul style="list-style-type: none"> – (U) Continue tower testing threat-adaptable, laser based jamming techniques to defeat IR missiles in accordance with the joint-Service demonstration plan. – (U) Conduct live-fire IR missile firing at White Sands Missile Range against the technology demonstration hardware developed for a threat-adaptable, laser-based IR countermeasure system for large aircraft. – (U) Design, fabricate, and begin integration of flight-worthy closed-loop laser IRCM for flight demonstrations on a C-17 or surrogate large aircraft to support risk reduction efforts for development of an affordable, closed-loop laser IRCM system. – (U) Continue to conduct in-house experiments to analyze the latest acquired threat missile operation, develop countermeasure techniques, and assist in developing digital models of potential threat IR seekers. – (U) Complete development and integration of a new target simulator for imaging IR seekers. – (U) Continue development of a reduced-sized, threat-adaptable, laser-based IR countermeasure concept for tactical combat aircraft. – (U) Complete development of IR imaging countermeasure concept and laboratory demonstration. – (U) Continue the development of hardware for field demonstration of countermeasures against advanced imaging IR missile seekers. <li> – (U) \$1,998 Develop the laser warning and countermeasure technologies necessary to defeat advanced day/night electro-optical (EO)/infrared (IR) acquisition/tracking sensors on threat air defense systems. These technologies include on-board and off-board (expendable jammers), EO/laser countermeasures, and precision guided weapon countermeasures. <ul style="list-style-type: none"> – (U) Continue development of countermeasure concepts to defeat newly developed EO/IR tracking systems. – (U) Continue development of gimballess beam steering technologies that have applications to EO laser and IR countermeasures. – (U) Develop advanced countermeasure technologies to defeat anti-aircraft laser aided/guided weapon systems. – (U) Continue development and complete threat modeling technologies to counter enemy dual mode missile seekers. – (U) Develop cooperative on-board and off-board countermeasures using decoys and expendables. <li> – (U) \$902 Develop IR missile warning technologies for product improvement of existing and new aircraft-installed equipment. These technologies will lower life cycle costs and improve the performance required to detect advanced, low signature threat missiles. <ul style="list-style-type: none"> – (U) Complete design and fabrication of distributed aperture demonstration hardware sensors and processors for real-time processing demonstration of multiple passive functions (missile warning, forward looking IR (FLIR) navigation, defensive IR search-track). – (U) Develop clutter rejection techniques for man-made false-alarm sources in IR threat warning. <li> – (U) \$9,167 Total 		
Project 691X	Page 11 of 12 Pages	Exhibit R-2 (PE 0603270F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	22,137	17,249	21,121	21,622	21,332	21,548	22,694	Continuing	Continuing
0003 Launch Vehicle Technology	587	631	588	586	663	615	654	Continuing	Continuing
4373 Launch and Orbit Transfer Propulsion Technology	19,328	14,844	18,723	19,229	19,152	19,408	20,504	Continuing	Continuing
6339 Tactical Propulsion Technology	297	320	294	293	0	0	0	Continuing	Continuing
6340 Satellite Control and Maneuvering Propulsion Technology	1,925	1,454	1,516	1,514	1,517	1,525	1,536	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program develops and demonstrates advanced rocket propulsion and space launch technologies. This program provides the technological step necessary to transition the most promising rocket propulsion and space launch technologies to applications using full-scale, proof-of-principle demonstrations. The projects within this program are structured to support Air Force Space Command's and Air Combat Command's mission area requirements for space and missile technologies which include the goals established in the Integrated High Payoff Rocket Propulsion Technology Initiative, a multi-agency/industry effort to focus the development of U.S. rocket propulsion technology.

New and improved components will be integrated with the environmentally improved propellants developed in this program to create new propulsion systems for the next generation of launch vehicles and satellites. Anticipated technological advances in this program will improve the performance of expendable systems' payload capabilities by 21% and reduce the launch and operations and support (O&S) costs by 28%. In a reusable launch system, the anticipated improvements are an increase in payload capability of 170% and a reduction in launch and O&S costs of 79%. The advances in propulsion in this program result from the achievement of the 2010 goals of the Integrated High Payoff Rocket Propulsion Technology Initiative. The development of these technologies has been coordinated with National Aeronautics and Space Administration (NASA) to eliminate duplication of efforts. The space launch and missile propulsion industry will leverage the technologies from this program to enhance the country's industrial competitiveness.

Note: Congress added \$5 million for Integrated High Payoff Rocket Propulsion Technology (IHRPT), \$2 million for Pentaborane Disposal, and \$3 million for Scorpius in FY 1997 which explains the perceived decrease in FY 1998. Investments in tactical propulsion technology in FYs 2001 and out are being evaluated at this time. In FYs 1999 and out, additional emphasis has been placed on space launch technology.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	22,353	16,247	22,037	Cont
(U) Appropriated Value	23,240	18,147		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-488	-609		
b. SBIR	-399	-289		
c. Omnibus/Other Above Threshold Reprogrammings				
d. Below Threshold Reprogrammings	-178			
e. Rescissions	-38			
(U) Adjustments to Budget Year Since FY 1998 PB			-916	
(U) Current Budget Submit/FY 1999 PB	22,137	17,249	21,121	Cont

(U) **Change Summary Explanation:**

Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.
Schedule: Not Applicable.

Technical: Not Applicable

(U) **C. Other Program Funding Summary:** Not Applicable.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 0003
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0003 Launch Vehicle Technology	587	631	588	586	663	615	654	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops advanced and innovative launch vehicle technologies in the areas of structures (i.e., fairings, interstages, struts, thermal protection systems, etc.), tanks, and operations.

(U) FY 1997 (\$ in Thousands):

- (U) \$150 Continued to define technological needs for future reusable military launch vehicles including operations technologies, lightweight airframe structures, durable composite cryogenic tanks, and all-weather thermal protection.
- (U) \$70 Continued to define technological needs for future expendable launch vehicles including operations technologies, lightweight airframe structures, durable composite cryogenic tanks, and all-weather thermal protection.
- (U) \$367 Fabricated test article for future launch vehicles, using and validating techniques that promise up to 40% weight reduction and 30-60% cost reduction.
- (U) \$587 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$130 Continue to define technological needs for future reusable military launch vehicles including operations technologies, lightweight airframe structures, durable composite cryogenic tanks, and all-weather thermal protection.
- (U) \$60 Continue to define technological needs for future expendable launch vehicles including operations technologies, lightweight airframe structures, durable composite cryogenic tanks, and all-weather thermal protection.
- (U) \$441 Complete fabrication and qualification of full-size advanced composite interstages for future launch vehicles, using and validating techniques that promise up to 40% weight reduction and 30-60% cost reductions.
- (U) \$631 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 0003															
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$150 Continue to define technological needs for future reusable military launch vehicles including operations technologies, lightweight airframe structures, durable composite cryogenic tanks, and all-weather thermal protection. - (U) \$100 Continue to define technological needs for future expendable launch vehicles including operations technologies, lightweight airframe structures, durable composite cryogenic tanks, and all-weather thermal protection. - (U) \$338 Initiate lightweight acoustically damped payload shroud development effort for eventual technology transfer to Evolved Expendable Launch Vehicle (EELV.) - (U) \$588 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1997</th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1998</th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1999</th> <th style="text-align: center; border-bottom: 1px solid black;">Total Cost</th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">588</td> <td style="text-align: center;">663</td> <td style="text-align: center;">663</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">587</td> <td style="text-align: center;">631</td> <td style="text-align: center;">588</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) <u>C. Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602102F, Materials. - (U) PE 0602601F, Phillips Laboratory. - (U) PE 0603401F, Advanced Spacecraft Technology. - (U) PE 0603853F, Evolved Expendable Launch Vehicle Program. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) <u>D. Schedule Profile:</u> Not Applicable.</p>				FY 1997	FY 1998	FY 1999	Total Cost	(U) Previous President's Budget (FY 1998 PB)	588	663	663	Cont	(U) Current Budget Submit/FY 1999 PB	587	631	588	Cont
	FY 1997	FY 1998	FY 1999	Total Cost													
(U) Previous President's Budget (FY 1998 PB)	588	663	663	Cont													
(U) Current Budget Submit/FY 1999 PB	587	631	588	Cont													
Project 0003	Page 4 of 12 Pages	Exhibit R-2 (PE 0603302F)															

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 4373
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4373 Launch and Orbit Transfer Propulsion Technology	19,328	14,844	18,723	19,229	19,152	19,408	20,504	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops advanced and innovative, low-cost rocket turbomachinery and components, low-cost space and missile launch propulsion system manufacturing technologies, and advanced propellants. Characteristics such as environmental acceptability, affordability, reliability, reduced weight, reduced operation and launch costs, and increased life and performance of propulsion systems are emphasized in this project. Technological advances developed in this program will improve the performance of expendable systems' payload capabilities by 21% and reduce the launch and operations and support (O&S) costs by 28%. The advances in propulsion in this program will result from the achievement of the 2010 goals of the Integrated High Payoff Rocket Propulsion Technology Initiative.

(U) FY 1997 (\$ in Thousands):

- (U) \$3,294 Developed advanced, environmentally acceptable propellants technology for current and future launch systems.
 - (U) Published final report assessing the increased performance benefits of a new, non-toxic chlorine-free propellant for replacement of current propellants in solid launch systems.
 - (U) Continued studying current and proposed environmental regulations for their impact on the manufacturing of large-scale solid rocket booster propellants.
- (U) \$2,000 Began disposal of pentaborane.
- (U) \$12,858 Developed propulsion technologies for existing and future launch vehicles.
 - (U) Integrated fluid film bearing technologies into the oxygen and hydrogen rocket turbopumps, increasing liquid-booster propulsion performance.
 - (U) Began development of advanced, lightweight, thrust chamber components to be integrated with rocket turbopumps and preburners.
 - (U) Designed and fabricated a complete thrust chamber with extended thermal-cycle life, decreased system costs, and increased liquid engine reliability that will be used in boost and orbit transfer missions.
- (U) \$1,176 Developed propulsion technologies for Advanced Orbit Transfer Vehicles
 - (U) Developed High Power Hall Thruster Technologies
 - (U) Developed technologies for use in Pulsed Plasma Thrusters
- (U) \$19,328 Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 4373
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(U) FY 1998 (\$ in Thousands):

- (U) \$9,503 Develop propulsion technologies for existing and future launch vehicles.
 - (U) Continue fabrication of turbopump assemblies and begin testing in relative environment.
 - (U) Continue development of advanced lightweight thrust chamber components for integration into advanced liquid booster.
- (U) \$1,341 Develop propulsion technologies for existing and future upperstage and orbit transfer vehicles.
 - (U) Complete design and begin fabrication and assembly of a high pressure liquid oxygen/hydrogen upperstage engine.
 - (U) Design High Performance Hall Thruster for orbital transfer vehicle (OTV).
 - (U) Design Pulsed Plasma Thruster for MightySat demonstration.
- (U) \$4,000 Develop technologies for the sustainment of strategic systems.
- (U) \$14,844 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$12,478 Develop propulsion technologies for existing and future launch vehicles.
 - (U) Complete testing of turbopump assembly and preburner components for integration into an advanced liquid booster.
 - (U) Complete assembly and engine testing of a 1200 psi liquid oxygen/hydrogen upperstage engine.
- (U) \$2,245 Develop propulsion technologies for existing and future upperstage and orbit transfer vehicles.
 - (U) Complete assembly and engine testing of a high pressure liquid oxygen/hydrogen upperstage engine.
 - (U) Design High Performance Hall Thruster for OTV.
 - (U) Design Pulsed Plasma Thruster for MightySat demonstration.
- (U) \$4,000 Develop technologies for the sustainment of strategic systems.
- (U) \$18,723 Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 4373
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	19,526	13,707	19,488	Cont
(U) Current Budget Submit/FY 1999 PB	19,328	14,844	18,723	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602601F, Phillips Laboratory.
- (U) PE 0603853F, Evolved Expendable Launch Vehicle Program.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 6339
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
6339 Tactical Propulsion Technology	297	320	294	293	0	0	0	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops highly energetic propellants and propulsion systems. Improved case, insulation, and propellant interfaces as well as better performing nozzles will be developed. Technology such as thrust vector control, thrust modulation, signature characterization, and signature reduction will be developed in this project. The emphasis in this project is on rocket propulsion system affordability, weight reduction. Anticipated payoffs from these developments, identified through the Integrated High Payoff Rocket Propulsion Technology Initiative (IHPRPT), include a 49% range increase, 50% size reduction, 100% payload increase, and 21% reduction in time-to-target.

(U) FY 1997 (\$ in Thousands):

- (U) \$99 Developed, in lab-size quantities, propellants that can be incorporated into the design and manufacturing of missile systems that will result in higher performance, lower environmental impacts, and reduced signature characteristics.
- (U) \$99 After developing the propellants, tested characteristics of propellants in lab-size quantities.
- (U) \$99 In conjunction with propellant development, developed and characterized, in lab-size quantities, components that can be incorporated into the design and manufacturing of missile systems that will result in higher performance, lower environmental impacts, and reduced signature characteristics.
 - (U) Demonstrated environmentally acceptable, reduced smoke, low-erosion tactical missile propellants and components that improve missile thrust and reduce plume signatures.
- (U) \$297 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$107 Develop, in lab-size quantities, propellants that can be incorporated into the design and manufacturing of missile systems that will result in higher performance, lower environmental impacts, and reduced signature characteristics.
- (U) \$107 After developing the propellants, test characteristics of propellants in lab-size quantities.
- (U) \$106 In conjunction with propellant development, develop and characterize, in lab-size quantities, components that can be incorporated into the design and manufacturing of missile systems that will result in higher performance, lower environmental impacts, and reduced signature characteristics.
 - (U) Integrate component technologies and hardware for environmentally acceptable, reduced smoke, low-erosion tactical missile propellants and components that improve missile thrust and reduce plume signatures.
- (U) \$320 Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 6339
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(U) FY 1999 (\$ in Thousands):

- (U) \$98 Develop, in lab-size quantities, propellants that can be incorporated into the design and manufacturing of missile systems that will result in higher performance, lower environmental impacts, and reduced signature characteristics.
- (U) \$98 After developing the propellants, test characteristics of propellants in lab-size quantities.
- (U) \$98 In conjunction with propellant development, develop and characterize, in lab-size quantities, components that can be incorporated into the design and manufacturing of missile systems that will result in higher performance, lower environmental impacts, and reduced signature characteristics.
 - (U) Integrate component technologies and hardware for environmentally acceptable, reduced smoke, low-erosion tactical missile propellants and components that improve missile thrust and reduce plume signatures.
- (U) \$294 Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 6339
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	298	336	340	Cont
(U) Current Budget Submit/FY 1999 PB	297	320	294	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602601F, Phillips Laboratory.
- (U) PE 0602303A, Missile Technology.
- (U) PE 0603313A, Missile and Rocket Advanced Technology.
- (U) PE 0603792N, Advanced Technology Transition.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 6340
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
6340 Satellite Control and Maneuvering Propulsion Technology	1,925	1,454	1,516	1,514	1,517	1,525	1,536	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: Chemical, electric, and solar rocket propulsion system technologies for station keeping and on-orbit maneuvering applications are developed in this project. Technology areas investigated include ground demonstrations of compact, lightweight, advanced propulsion systems, higher efficiency energy conversion systems (derived from an improved understanding of combustion fundamentals), and high-energy chemical propellants. The payoffs for the Integrated High Payoff Rocket Propulsion Technology Initiative (IHRPT) include a seven-year increase in satellite on-orbit time, a 50% increase in satellite maneuvering capability, a 25% reduction in orbit transfer operational costs, and a 15% increase in satellite payload.

(U) FY 1997 (\$ in Thousands):

- (U) \$1,237 Demonstrated solar electric propulsion technologies for orbit transfer and maneuvering propulsion technology.
 - (U) Supported launch and space demonstration of the 30 kilowatt (kW) ammonia arcjet thruster.
- (U) \$100 Demonstrated solar electric propulsion technologies for orbit transfer and maneuvering propulsion technology.
 - (U) Analyzed data from 30kW Ammonia arcjet thruster.
- (U) \$588 Demonstrated solar thermal propulsion technologies for orbit transfer and maneuvering propulsion technology.
 - (U) Designed the Solar Thermal Balloon Flight experiment.
- (U) \$1,925 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$288 Demonstrate solar electric propulsion technologies for orbit transfer and maneuvering propulsion technology.
 - (U) Analyze data from 30kW Ammonia arcjet thruster.
 - (U) Draft final report for 30kW Ammonia arcjet thruster.
- (U) \$254 Demonstrate solar thermal propulsion technologies for orbit transfer and maneuvering propulsion technology.
 - (U) Fabricate components for the Solar Thermal Balloon Flight Experiment
- (U) \$912 Demonstrate post-boost vehicle strategic sustainment technologies.
 - (U) Begin development of post boost vehicle component technologies.
- (U) \$1,454 Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603302F Space and Missile Rocket Propulsion	PROJECT 6340
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(U) FY 1999 (\$ in Thousands):

- (U) \$516 Demonstrate solar thermal propulsion technologies for orbit transfer and maneuvering propulsion technology.
 - (U) Begin testing and analyze performance, life, and integration improvements for the Solar Thermal Balloon Flight Experiment
- (U) \$500 Demonstrate post-boost vehicle strategic sustainment technologies.
 - (U) Continue development of post-boost vehicle component technologies.
- (U) \$500 Demonstrate post-boost vehicle strategic sustainment technologies.
 - (U) Continue development of post-boost vehicle propellant technologies.
- (U) \$1,516 Total

(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	1,941	1,541	1,546	Cont
(U) Current Budget Submit/FY 1999 PB	1,925	1,454	1,516	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602601F, Phillips Laboratory.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603311F Ballistic Missile Technology	PROJECT 4091
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4091 Missile Electronics	3,253	7,537	0	0	0	0	0	10,740	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program funds the development, and particularly the integrated demonstration, of advanced guidance, navigation, and control packages for ballistic missiles. These technologies are flown as Missile Technology Demonstration flights. Efforts directly support strategic force sustainment, space force applications, and space navigation. Also funded are upgrades for range and safety instrumentation for ballistic missiles. Emphasis is on technologies which increase safety, reduce maintenance, and improve reliability of the currently deployed intercontinental ballistic missile (ICBM) force at a lower life cycle cost. Future precision guidance and navigation technologies are demonstrated on sounding rocket and ICBM flights that support conventional ballistic missiles and hard and deeply buried target defeat capability technology needs. Note: This program was eliminated at the end of FY 1997, however, Congress added funds for Missile Technology Demonstration (MTD) flight testing and Radiation Hardened Electronics in FY 1998.

(U) FY 1997 (\$ in Thousands):

- (U) \$927 Developed advanced boost guidance technology to reduce current operations costs and improve reliability and maintainability of existing systems and develop precision navigation systems for future ICBM-delivered conventional munitions.
- (U) Tested advanced solid state navigation technology in a laboratory environment and on a sounding rocket for precision strike applications.
- (U) \$2,326 Developed advanced navigation technology to support range instrumentation and improve safety requirements.
- (U) Integrated and tested Global Positioning System (GPS)-based navigation packages coupled directly with Inertial Navigation Systems (INS) to improve the accuracy, range, and safety of reentry vehicles for experimentation on missile test ranges.
- (U) \$3,253 Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603311F Ballistic Missile Technology	PROJECT 4091
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(U) FY 1998 (\$ in Thousands):

- (U) \$4,272 Develop advanced boost guidance technology to reduce current operations costs and improve reliability and maintainability of existing systems and develop precision navigation systems for future intercontinental ballistic missile (ICBM)-delivered conventional munitions.
 - (U) Begin development, integration, and testing of advanced solid state navigation technology for ICBM and space applications.
- (U) \$250 Develop advanced navigation technology to support range instrumentation and improve safety requirements.
 - (U) Begin development, integration, and testing of the Global Positioning System (GPS)-based navigation packages coupled directly with Inertial Navigation Systems (INS) to improve the accuracy, range, and safety of ballistic missiles and space systems.
- (U) \$715 Develop radiation hardened analog circuit technology for missile guidance systems.
 - (U) Design and fabricate a twelve-bit analog converter.
 - (U) Stimulate a new second source supplier for radiation hardened analog components.
- (U) \$2,300 Improve radiation hardened digital circuit fabrication process to facilitate evolutionary missile technology.
 - (U) Establish new design tools for miniaturizing radiation hardened computer components.
 - (U) Initiate design effort to decrease digital circuit size by 50% while keeping pace with commercial computer performance.
- (U) \$7,537 Total

(U) FY 1999: Not Applicable.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603311F Ballistic Missile Technology	PROJECT 4091
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost Cont</u>
(U) Previous President's Budget (FY 1998 PB)	2,699	0	0	
(U) Appropriated Value	2,828	8,000		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-61	-262		
b. SBIR	-68	-201		
c. Omnibus/Other Above Threshold Reprogrammings	-6			
d. Below Threshold Reprogrammings	565			
e. Rescissions	-5			
(U) Adjustments to Budget Year Since FY 1998 PB				
(U) Current Budget Submit/FY 1998 PB	3,253	7537	0	TBD

(U) Change Summary Explanation:

Funding: Due to higher priorities within the Science and Technology (S&T) Program, this project was scheduled to be terminated at the end of FY 1997, however, Congress added funds in FY 1998.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602204F, Aerospace Avionics.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology					
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	72,925	54,899	42,571	47,005	50,961	53,980	53,781	Continuing	Continuing
1026 Space Structures and Controls Technology	1,058	940	1,788	3,181	3,937	3,516	3,571	Continuing	Continuing
2181 Space Electronics and Software Technology	11,975	12,707	12,982	14,758	13,996	15,182	13,375	Continuing	Continuing
3784 Space Sensors and Satellite Communication Technology	2,177	2,710	1,760	3,556	4,273	3,865	3,930	Continuing	Continuing
3834 Integrated Space Technology Demonstrations	37,847	17,739	20,447	18,255	19,034	20,780	21,867	Continuing	Continuing
4400 Satellite Survivability Technology	5,734	5,310	826	1,294	2,021	3,271	3,514	Continuing	Continuing
4599 Reusable Launch Vehicle Technology	9,579	11,715	0	0	0	0	0	TBD	TBD
682J Space Power and Thermal Management Technology	4,555	3,778	4,768	5,961	7,700	7,366	7,524	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program develops advanced spacecraft technologies such as structures, electronics, thermal, power, and sensors; and demonstrates them in an appropriate fashion (i.e., component or system, ground, or flight). The broad goals of the program are to decrease the time for innovative space technology to be transitioned to the warfighter and to reduce the associated development costs and risks of future Air Force space-based systems. Developmental efforts are focused on six high-payoff, satellite technology areas: (1) reusable launch vehicle technologies; (2) advanced space structures and structural controls; (3) hardened space electronics and satellite control software; (4) advanced passive/active space-based sensors and satellite communications; (5) compact, low-cost space power and thermal management; and (6) satellite survivability. Note: Congress added \$37 million in FY 1997 (\$10 million for Reusable Launch Vehicle (RLV) technology, \$25 million for Microsat development, and \$2 million for Miniature Threat Reporting System) and \$17.5 million in FY 1998 (\$5 million for Low-Cost Launch Vehicle Technologies [previously funded in PE 0603302F/0634373], \$7.5 million for Solar Thermionics Orbital Transfer Vehicle, and \$5 million for Miniature Threat Reporting System) which explains the perceived decrease in FYs 1999 and out. In FYs 1999 and out, additional emphasis has been placed on evolutionary growth in space technologies. Funds added by the Congress in FY 1998 for RLV (Military Spaceplane) and Microsat (Clementine 2) were line item vetoed by the President. Note: Project 4599 was previously called Project 0003, Reusable Launch Vehicle Technology. However, in FY 1996, this project was moved to PE 0603302F, Space and Missile Launch Technology, and renamed Launch Vehicle Technology to allow for Air Force investigation of all reusable and expendable launch technologies. In FY 1997, the only funds remaining in Project 0003 in PE 0603401F were the funds added by Congress specifically for Reusable Launch Vehicle

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development		PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology		
<p>technology. To avoid confusion with Project 0003, Launch Vehicle Technology, in PE 0603302F, Project 0003 in PE 0603401F was renumbered Project 4599, keeping its Reusable Launch Vehicle title. In FY 1998, the low-cost launch vehicle technology development program was moved from PE 0603302F, Project 4373, to this project.</p>				
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	73,215	40,846	44,679	Cont
(U) Appropriated Value	76,637	98,346		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,728	-2,112		
b. SBIR	-1,694	-1,335		
c. Omnibus/Other Above Threshold Reprogrammings				
d. Below Threshold Reprogrammings	-290			
e. Recissions				
f. Line Item Veto		-40,000		
(U) Adjustments to Budget Year Since FY 1998 PB			-2,108	
(U) Current Budget Submit/FY 1999 PB	72,925	54,899	42,571	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 1026
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1026 Space Structures and Controls Technology	1,058	940	1,788	3,181	3,937	3,516	3,571	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project demonstrates advanced composite structures and structural control technologies for future Air Force space and missile systems. Prior to FY 1995, the Air Force relied on Ballistic Missile Defense Organization (BMDO) funding to address its needs in this technology area. As BMDO budgets have declined, so has their funding in this area, necessitating an increased Air Force investment to maintain critical spacecraft structures and controls technologies. Advanced space structure component efforts focus on the demonstration of new composite structure technologies. The goal is to significantly improve the payload mass fraction and reduce overall spacecraft fabrication time and cost. This project also pays for the development of advanced passive and active spacecraft structural control technologies. Structural vibration and shock suppression technologies are intended to significantly enhance space platform stability, improving the focusing/imaging ability of space-based optical components such as focal plane arrays developed in Project 3784 or solar cells developed in Project 682J.

(U) FY 1997 (\$ in Thousands):

- (U) \$484 Developed advanced spacecraft structure technologies.
 - (U) Completed first phase of multifunctional structure technology demonstration.
 - (U) Developed advanced lightweight spacecraft structure for MightySat.
- (U) \$244 Developed advanced spacecraft structural control and mechanisms technologies.
 - (U) Completed first phase of joint technology demonstration program to isolate sensitive payloads from on-orbit disturbances. System to be flight demonstrated on Space Test Research Vehicle 2 (STRV2.)
 - (U) Continued joint program to develop advanced mechanisms which will revolutionize the design of solar array subsystems. System will be flight demonstrated in FY 1999 as part of National Aeronautics and Space Administration (NASA) Earth Observation-1 (EO-1) mission.
- (U) \$330 Developed advanced spacecraft launch vibration isolation system.
 - (U) Completed preliminary design of launch vibration isolation system. System to support first military Evolved Expendable Launch Vehicle (EELV) launch in FY 2001.
- (U) \$1,058 Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 1026
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U)	\$21	Develop advanced spacecraft structure technologies.
		– (U) Initiate conformal grid stiffened cryogenic propellant tank program.
– (U)	\$340	Develop advanced spacecraft structural control and mechanisms technologies.
		– (U) Complete flight demonstration program to isolate sensitive payloads from on-orbit disturbances on Space Test Research Vehicle 2 (STRV2.)
		– (U) Complete joint program to develop advanced mechanisms which will revolutionize the design of solar array subsystems. System will be flight demonstrated in FY 1999 as part of National Aeronautics and Space Administration (NASA) Earth Observation-1 (EO-1) mission.
– (U)	\$579	Develop advanced spacecraft launch vibration isolation system.
		– (U) Complete design of launch vibration isolation system and begin fabrication to support first military Evolved Expendable Launch Vehicle (EELV) launch in FY 2001.
– (U)	\$940	Total
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U)	\$755	Develop advanced spacecraft structures technologies.
		– (U) Initiate lightweight space-based antenna structure flight experiment.
– (U)	\$441	Develop advanced spacecraft structural control and mechanisms technologies.
		– (U) Complete flight demonstration of component isolation system program to isolate sensitive payloads from on-orbit disturbances.
		– (U) Fabricate and qualify miniature isolation system for sensors and communications systems.
– (U)	\$592	Develop advanced spacecraft launch vibration isolation system.
		– (U) Fabricate and qualify the launch vibration isolation system to support first military EELV launch in FY 2001.
– (U)	\$1,788	Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 1026
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	1,058	987	2,544	Cont
(U) Current Budget Submit/FY 1999 PB	1,058	940	1,788	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602601F, Phillips Laboratory.
- (U) PE 0603218C, Research and Support.
- (U) PE 0603302F, Space and Missile Launch Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 2181
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2181 Space Electronics and Software Technology	11,975	12,707	12,982	14,758	13,996	15,182	13,375	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project funds the demonstration and evaluation of electronic hardware and software. Improved space-qualifiable electronics and software for data and signal processing are to be more interchangeable, interoperable, and standardized. In the near-term, this project's work concentrates on converting (i.e., hardening) commercial data and signal processor technologies for use in Air Force space systems. Advanced electronic packaging technologies that reduce weight and volume are being developed for military space applications. Space data processor technologies like the Advanced Technology Insertion Module (ATIM 32-bit) technology are developed and demonstrated. The Advanced Spaceborne Computer Module (ASCM), ATIM's 16-bit predecessor, is currently baselined into 65 DoD, National Aeronautics and Space Administration (NASA), and commercial programs. Also developed and demonstrated are space signal processor technologies like the Hardened Ada Signal Processor (HASP) program. For mid-term applications, the Improved Space Computer Program (ISCP) will merge advanced, radiation-hardened space processor, memory, and interconnect technologies with commercially derived, open system architectures to develop and demonstrate robust, on-board processing capabilities for 21st century DoD satellites. Low-cost, easily modifiable software and hardware architectures for ground control, satellite components, and autonomous satellite operations are also developed. The Multi-mission Advanced Ground Intelligent Control (MAGIC) program in this project has developed a low-cost, flexible architecture for satellite control and mission operations. In the long-term, this project area focuses on developing an integrated avionics-like architecture for satellites where high-speed data busses centralize many of the functions now distributed on the spacecraft. Additionally, this project demonstrates very low-power electronics allowing dramatic size, weight, and power reductions for future Air Force Space applications.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 2181
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$6,722 Developed space-qualifiable, advanced low-power, hardened data processors and memory technologies. <ul style="list-style-type: none"> – (U) Fabricated space-qualifiable 32-bit processor-based computers and demonstrated the full range of performance capabilities. – (U) Designed an advanced, high throughput, low-power data processor based on commercial technology. – (U) \$1,242 Developed space-qualifiable, hardened signal processor electronics technologies. <ul style="list-style-type: none"> – (U) Fabricated silicon on insulator (SOI) version of space-qualifiable digital signal processor. – (U) Evaluated the ability of both bulk silicon and SOI versions of the digital signal processor to perform in the space environment. – (U) \$1,337 Developed space-qualifiable, advanced, mixed-signal electronics packaging technology such as three-dimensional (3-D) wafer scale integration. <ul style="list-style-type: none"> – (U) Began demonstration of integrated sensor processing 3-D electronics assembly in robust space-qualifiable configuration. – (U) Began demonstration of improved multi-chip module technology by constructing a complex multi-processor system. – (U) \$2,483 Developed reusable, standardized satellite operations software. <ul style="list-style-type: none"> – (U) Continued enhancing multi-mission advanced ground intelligent control software to provide operator assistance with unknown anomaly resolution and expanded software to include independent decision making capability. – (U) Continued development of technologies for artificial intelligence assisted satellite operator systems. – (U) Continued software support of the satellite command and control system upgrade. – (U) \$191 Designed and developed space-qualifiable silicon components using advanced micro-electro-mechanical systems (MEMS) techniques. <ul style="list-style-type: none"> – Evaluated the compatibility of fabrication and packaging processes for highly integrated MEMS/electronics components able to operate in the space environment. – Designed advanced experimental MEMS devices and demonstrated their performance in a space environment. – (U) \$11,975 Total 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 2181
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$8,611 Develop affordable, space-qualifiable, low-power, high performance microelectronic technologies (processors, memories, gate arrays, etc.). <ul style="list-style-type: none"> – (U) Complete space-qualifiable 32-bit processor-based components and demonstrate the full range of performance capabilities. – (U) Continue design of an advanced, high throughput, low-power data processor based on commercial technology. – (U) Complete design of silicon-on-insulator (SOI) version of the space-qualifiable digital signal processor. – (U) Complete evaluation of the ability of both bulk silicon and SOI versions of the digital signal processor to perform in the space environment. – (U) \$1,142 Develop space-qualifiable, high density advanced packaging technology for digital, analog, and mixed-signal electronic devices. <ul style="list-style-type: none"> – (U) Continue developing integrated three-dimensional (3-D) sensor processing electronics in robust space-qualifiable configuration. – (U) Continue improving multi-chip module technology by constructing a complex multi-processor system; evaluate in space environment. – (U) \$2,643 Develop reusable, standardized satellite operations software. <ul style="list-style-type: none"> – (U) Complete enhancements for multi-mission advanced ground intelligent control software to provide operator assistance with unknown anomaly resolution and expansion of software to include independent decision making capability. – (U) Complete development of artificial intelligence assisted satellite operator systems. – (U) Initiate development of integrated applications for modeling and simulation technologies. – (U) Continue software support of the satellite command and control system upgrade; initiate software engineering effort for space-based autonomous operations. – (U) \$311 Design and develop space-qualifiable silicon components using advanced micro-electro-mechanical systems (MEMS) techniques. <ul style="list-style-type: none"> – (U) Continue to evaluate the compatibility of fabrication and packaging processes for highly integrated MEMS/electronics components able to operate in the space environment. – (U) Complete design advanced experimental MEMS devices and demonstrate their performance in a space environment. – (U) Continue fabrication of solid state micro-mechanical guidance instruments. – (U) \$12,707 Total 		
Project 2181	Page 8 of 27 Pages	Exhibit R-2 (PE 0603401F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		February 1998
3 - Advanced Technology Development	PE NUMBER AND TITLE	PROJECT
	0603401F Advanced Spacecraft Technology	2181
(U) <u>FY 1999 (\$ in Thousands):</u>		
- (U) \$8,660	Develop affordable, space-qualifiable, low-power, high performance microelectronic technologies (processors, memories, gate arrays, etc.).	
	- (U) Continue design of an advanced, high throughput, low-power data processor based on commercial technology.	
	- (U) Develop integrated space computer version of advanced digital signal processor to perform in the space environment.	
	- (U) Initiate development of advanced next-generation digital signal processing technology and scaleable multi-processor arrays.	
	- (U) Develop space-qualifiable high-performance electronics that provide maximum flexibility to space system designers (e.g., high-gate-count field programmable gate arrays).	
- (U) \$1,147	Develop space-qualifiable, high density advanced packaging technology for digital, analog, and mixed-signal electronic devices.	
	- (U) Continue integrated three-dimensional (3-D) sensor processing electronics assembly in robust space-qualifiable configuration.	
	- (U) Continue improving multi-chip module technology by constructing a complex multi-processor system; evaluate in space environment.	
- (U) \$2,223	Develop reusable, standardized satellite operations software.	
	- (U) Continue to integrate and test space-based autonomous satellite operations software system technologies.	
	- (U) Continue development of integrated applications for modeling and simulation technologies.	
	- (U) Continue software support of the satellite command and control system upgrade.	
- (U) \$39	Design and develop space-qualifiable silicon components using advanced micro-electro-mechanical systems (MEMS) techniques.	
	- (U) Continue to evaluate the compatibility of fabrication and packaging processes for highly integrated MEMS/electronics components able to operate in the space environment.	
	- (U) Complete design of advanced experimental MEMS devices and demonstrate their performance in a space environment.	
- (U) \$913	Develop real-time space simulation for training and Concept of Operations (CONOPs).	
	- (U) Enhance simulation architecture for real-time and variable fidelity operations.	
	- (U) Continue development of advanced bus health and status models for autonomous operations.	
	- (U) Upgrade fidelity of surveillance payload models.	
- (U) \$12,982	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology				PROJECT 3784	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3784 Space Sensors and Satellite Communication Technology	2,177	2,710	1,760	3,556	4,273	3,865	3,930	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project funds the development of military space-based ground surveillance and satellite communication technologies. The project's work focuses on advancing space-based applications of commercial sensors and communication technologies while improving the performance, schedule, maturity, cost, and/or risk reduction. The focus of the space sensor effort is to meet spaceborne sensor needs for national missile defense and intelligence, surveillance, and reconnaissance missions. The focus of the satellite communications effort is to develop radio frequency (RF) technologies for future military, intra-space, and space-ground communication systems. This project seeks to improve affordability, reliability, and performance while significantly reducing space sensor and satellite communication size, weight, cost, and cooling and power requirements.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,007 Developed space-based reconnaissance/surveillance sensor technology to meet high priority Air Force needs. <ul style="list-style-type: none"> - (U) Investigated state-of-the-art techniques for raising the operating temperature (120K or higher) of mid-wave infrared detectors. - (U) Initiated investigation of technologies for scaling mercury cadmium telluride (HgCdTe) focal plane arrays to 1024 by 1024 array size. - (U) \$650 Developed space-based radar technology investment plans. <ul style="list-style-type: none"> - (U) Began development and evaluation of potential antenna architectures. - (U) Continued assessment of operational utility of candidate space-based surveillance technologies. - (U) \$258 Developed simulation models for Space-Based Radar (SBR) system. <ul style="list-style-type: none"> - (U) Assessed potential distributed interactive simulation compatible models for application to SBR scenarios. - (U) Initiated development of distributed interactive simulation models for SBR. - (U) \$262 Developed satellite communication technology which supports space communications needs. <ul style="list-style-type: none"> - (U) Completed assessment of commercial communication technology for transition to military systems. - (U) \$2,177 Total 									
Project 3784		Page 11 of 27 Pages				Exhibit R-2 (PE 0603401F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 3784
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<p>– (U) \$1,515</p>	<p>Develop space-based reconnaissance/surveillance sensor technology to meet high priority Air Force needs.</p>	
	<p>– (U) Initiate design and development effort for mid-wave infrared detectors with higher operating temperatures (120 to 140K) .</p>	
	<p>– (U) Complete investigation of scaling technologies for mercury cadmium telluride focal plane arrays.</p>	
	<p>– (U) Investigate efforts to increase yield and reliability of large format infrared focal plane arrays.</p>	
<p>– (U) \$904</p>	<p>Develop space-based radar technology investment plans.</p>	
	<p>– (U) Continue development and evaluation of potential antenna architectures and radar concepts.</p>	
	<p>– (U) Continue to assess the operational utility of candidate space-based surveillance technologies.</p>	
	<p>– (U) Begin development of testbed for Space-Based Radar (SBR) system integration and operational evaluation.</p>	
<p>– (U) \$291</p>	<p>Develop simulation models for SBR system.</p>	
	<p>– Continued development of distributed interactive simulation models for SBR.</p>	
<p>– (U) \$2,710</p>	<p>Total</p>	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p>		
<p>– (U) \$300</p>	<p>Develop space-based reconnaissance/surveillance sensor technology to meet high priority Air Force needs.</p>	
	<p>– (U) Complete fabrication of short-wave and mid-wave focal plane infrared detectors with higher operating temperatures (120 to 140K).</p>	
	<p>– (U) Evaluate and provide design recommendations on the short-wave and mid-wave focal plane infrared detectors with higher operating temperatures (120 to 140K).</p>	
<p>– (U) \$970</p>	<p>Develop space-based radar technology investment plans.</p>	
	<p>– (U) Complete development and evaluation of potential antenna architectures and radar concepts.</p>	
	<p>– (U) Continue to assess the operational utility of candidate space-based surveillance technologies.</p>	
	<p>– (U) Continue development of testbed for SBR system integration and operational evaluation.</p>	
<p>– (U) \$490</p>	<p>Develop simulation models for SBR system.</p>	
	<p>– Complete development of distributed interactive simulation models for SBR.</p>	
<p>– (U) \$1,760</p>	<p>Total</p>	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 3784															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">2,423</td> <td style="text-align: center;">2,848</td> <td style="text-align: center;">3,295</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">2,177</td> <td style="text-align: center;">2,710</td> <td style="text-align: center;">1,760</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) Related Activities:</p> <ul style="list-style-type: none"> - (U) PE 0303601F, MILSTAR Satellite Communications System. - (U) PE 0602601F, Phillips Laboratory. - (U) PE 0602702F, Command/Control/Communication Technology. - (U) PE 0603226E, Experimental Evaluation of Major Innovative Technologies. - (U) PE 0604711F, Extremely High Frequency Satellite Communications Research and Development. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY 1998 PB)	2,423	2,848	3,295	Cont	(U) Current Budget Submit/FY 1999 PB	2,177	2,710	1,760	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>													
(U) Previous President's Budget (FY 1998 PB)	2,423	2,848	3,295	Cont													
(U) Current Budget Submit/FY 1999 PB	2,177	2,710	1,760	Cont													
Project 3784	Page 13 of 27 Pages	Exhibit R-2 (PE 0603401F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 3834
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3834 Integrated Space Technology Demonstrations	37,847	17,739	20,447	18,255	19,034	20,780	21,867	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: The Integrated Space Technology Demonstration (ISTD) program is a series of demonstrations, or projects established to address the latest Air Force Space Command (AFSPC) Mission Area Plan (MAP) deficiencies. The ISTD program provides for the integration of government and commercially developed technologies onto satellites. The ISTD seeks to validate and demonstrate the value of these new technologies to address new space tactics, techniques, procedures, doctrine, and possibly revolutionize future acquisitions of DoD space systems. The ISTD program will enhance commercial and civil space assets in a cost-effective manner, allowing the warfighter to assess the utility of new space technologies through leveraging opportunities and, when required, through dedicated space flight demonstrations.

The highly successful Technology for Autonomous Operational Survivability (TAOS) satellite was the first of the ISTD series. TAOS was launched in March 1994 and is currently demonstrating advanced warfighter concepts and the viability of advanced computers, autonomous navigation hardware/software, laser sensors, radar sensors, and data busses in space. TAOS has allowed operators and users, for the first time, to directly conduct space exercises in conjunction with the Air Force Research Laboratory (AFRL). External customer funding will be used in FY1998 and out to continue TAOS operations until the satellite ceases to function.

In FY 1995, the ISTD program office initiated a cooperative agreement with National Aeronautics and Space Administration's (NASA) Small Spacecraft Technology Initiative (SSTI) program to leverage the NASA Clark satellite with Air Force funding and technologies. AFRL and NASA agreed to integrate an S-band transmitter on Clark to allow command and control of the satellite along with reception of imaging payload data from a mobile ground station controlled by the warfighter. Clark is set for launch in February 1998. In general, the ISTD series of space technology demonstrations will allow users to assess new space technologies, which, when integrated, will become technology options for future space systems. The Warfighter (WF-1) contract started in August to develop the capability of using hyperspectral imaging from space to detect tactical targets and perform battlefield characterization.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 3834
(U) <u>FY 1997 (\$ in Thousands):</u>		
– (U) \$1,513	Completed the Technology for Autonomous Operational Survivability (TAOS) flight demonstration. – (U) Completed TAOS final report. – (U) Extended TAOS close-out to December 1997 to allow time to start a new contract for on-orbit mission continuation. All FY 1998 operations will be customer funded.	
– (U) \$471	Prepared for joint Air Force/ National Aeronautics and Space Administration (NASA) on-orbit technology assessments and data collection of the Clark spacecraft.	
– (U) \$10,966	Conducted Integrated Space Technology Demonstration (ISTD) series program. – (U) Awarded contract for the ISTD Warfighter-1 hyperspectral technology demonstration project. – (U) Began design of Warfighter-1 payload and mobile ground station. – (U) Began procurement of long-lead items for payload and mobile ground station requirements. – (U) Began development and modification of algorithms for Warfighter-1 satellite payload and ground station.	
– (U) \$ 1,006	Developed simulation applications for integrated satellite payloads, mission utility, and system engineering. – (U) Delivered real-time surveillance payload simulations.	
– (U) \$23,891	Developed and demonstrated miniaturized space technologies. – (U) Selected a mission and developed component technologies for the Clementine 2 microsatellite technology development. – (U) Continued development and integration of spacecraft subsystems, bus system design, bi-propellant system, and non-toxic propulsion system for the Clementine 2 spacecraft.	
– (U) \$37,847	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$378	Perform joint Air Force/NASA on-orbit technology assessments and data collection of the Clark spacecraft.	
– (U) \$16,455	Conduct ISTD series program. – (U) Continue design and begin fabrication of Warfighter-1 payload and mobile ground station. – (U) Continue procurement of long lead items for payload and mobile ground station requirements. – (U) Continue development and modification of algorithms for Warfighter-1 satellite payload and ground station. – (U) Start initial planning for suite of technologies to be demonstrated in Warfighter-2.	
– (U) \$906	Develop simulation applications for integrated satellite payloads, mission utility, and system engineering. – (U) Continue development of advanced surveillance payload simulations.	
– (U) \$17,739	Total	
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 3834
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$100 Complete joint Air Force/National Aeronautics and Space Administration (NASA) on-orbit technology assessments and data collection of the Clark spacecraft, close out mission, and develop final report on technology and military utility assessment. - (U) \$19,072 Conduct Integrated Space Technology Demonstration (ISTD) series program. <ul style="list-style-type: none"> - (U) Complete design, fabrication, and integration of Warfighter-1 payload and mobile ground station. - (U) Perform integration and test of Warfighter-1 payload to Orbview 3 spacecraft. - (U) Ship space vehicle to launch site and begin integration of Warfighter-1/Orbview 3 space vehicle to launch vehicle. - (U) Continue development and modification of algorithms for Warfighter-1 satellite payload and ground station. - (U) Perform suite of technologies demonstrated in Warfighter-2. - (U) \$490 Develop advanced boost guidance technology to reduce current operations costs and improve reliability and maintainability of existing systems and develop precision navigation systems for future intercontinental ballistic missiles (ICBM) delivered conventional munitions. <ul style="list-style-type: none"> - (U) Develop, integrate, and test Global Positioning System/Inertial Navigation System (GPS/INS) in plasma and jamming environments for precision ICBM navigation. - (U) \$785 Develop advanced navigation technology to support range instrumentation and improve safety requirements. <ul style="list-style-type: none"> - (U) Develop, integrate, and test GPS-based navigation packages coupled directly with INS that survive and reacquire after the plasma blackout during reentry, and improve the accuracy, range, and safety of ballistic missiles. - (U) \$20,447 Total 		
Project 3834	Page 16 of 27 Pages	Exhibit R-2 (PE 0603401F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 3834
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	37,847	18,788	20,358	Cont
(U) Current Budget Submit/FY 1999 PB	37,847	17,739	20,447	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602601F, Phillips Laboratory.
- (U) PE 0603605F, Advanced Weapons Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 4400
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4400 Satellite Survivability Technology	5,734	5,310	826	1,294	2,021	3,271	3,514	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project funds the development and demonstration of technologies required to assure operation of U.S. space assets in potentially hostile warfighting environments. Work performed includes assessment of critical components, subsystems, and systems' threat susceptibility and vulnerability. This project also develops technologies to mitigate identified vulnerabilities. Further, technology options are developed and demonstrated to support balanced satellite protection strategies for detecting, avoiding, and operating in a hostile space environment. Efforts under this project will be closely integrated with exploratory space technologies such as those developed under PE 0602601F, Project 8809, and advanced space technologies developed under this PE in Projects 1026, 2181, 3784, and 682J. Where appropriate, end products include integrated demonstrations with technologies developed in Project 3834. Through this project, the Air Force assumes responsibility for critical spacecraft survivability technology from the Ballistic Missile Defense Organization (BMDO). Note: Congressional funds for the Miniaturized Satellite Threat Reporting System (MSTRS) were provided in FY 1997 (\$2 million) and in FY 1998 (\$5 million).

(U) FY 1997 (\$ in Thousands):

- (U) \$1,261 Assessed selected directed energy weapon threat environment susceptibility/vulnerability of critical space-based sensor and communications subsystems.
 - (U) Performed an assessment of laser and radio frequency (RF) weapon susceptibilities for spacecraft subsystems including mission optical sensors and communications payloads.
 - (U) Performed an experimental assessment of a Charge Coupled Device (CCD) sensor's susceptibility to RF illumination.
 - (U) Initiated development of a multi-threat sensor performance modeling tool.
- (U) \$1,204 Performed RF threat warning space-based sensor design, fabrication, and test.
 - (U) Integrated radar warning and intrusion/interference detector concepts.
 - (U) Completed antenna and snapshot recorder designs; initiated software design for digital receiver.
 - (U) Initiated fabrication of prototype antenna design.
- (U) \$2,065 Augmented baseline Threat Warning/Attack Reporting (TW/AR) by adding a broad-band Radar Warning Receiver for MSTRS.
 - (U) Completed preliminary design of RF front end and digital electronics for space experiment.
 - (U) Initiated fabrication of hardware including the microwave assembly, successive detection logarithmic amplifier, and microwave receiver.
- (U) \$1,204 Selected, for evaluation, laser weapon detection technologies for satellites in hostile environments.
 - (U) Completed TW/AR laser threat assessment and laser detection trade study.
 - (U) Initiated laser detector fabrication and functional test.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		February 1998
3 - Advanced Technology Development	PE NUMBER AND TITLE	PROJECT
	0603401F Advanced Spacecraft Technology	4400
– (U)	\$5,734	Total
 (U) <u>FY 1998 (\$ in Thousands):</u>		
– (U)	\$182	Continue susceptibility/vulnerability assessments of critical space-based subsystems to ambient/enhanced space environments and directed energy weapon threats.
– (U)		– (U) Update susceptibility/vulnerability assessments of hostile/stressing ambient/enhanced space environment on subsystem performance.
– (U)	\$182	Refine directed energy multi-threat sensor performance modeling tool.
– (U)	\$187	Evaluate protection implications of selected advanced spacecraft technologies.
– (U)	\$1,428	Design integrated Monolithic Microwave Integrated Circuit (MMIC) microwave pre-selector assembly and four multi-chip modules for a miniaturized satellite threat warning and attack reporting system.
– (U)	\$2,855	Fabricate and test integrated MMIC assembly and multi-chip modules for the miniaturized satellite threat warning and attack reporting system.
– (U)	\$476	Investigate composite materials and advanced packaging concepts for a miniaturized satellite threat warning and attack reporting system.
– (U)	\$5,310	Total
 (U) <u>FY 1999 (\$ in Thousands):</u>		
– (U)	\$43	Continue susceptibility/vulnerability assessments of critical space-based subsystems to ambient/enhanced space environments and directed energy weapon threats.
– (U)		– (U) Assess hostile/stressing environment impact on subsystem performance parameters using multithreat sensor modeling tool.
– (U)	\$490	Perform radio frequency (RF) threat warning space-based sensor design, fabrication, and test.
– (U)		– (U) Complete fabrication and test of RF payload for space experiment
– (U)	\$293	Select, for evaluation, laser weapon detector technologies for satellites in hostile environments.
– (U)		– (U) Complete fabrication and test of laser detector brassboard.
– (U)	\$826	Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 4400
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	5,778	592	582	Cont
(U) Current Budget Submit/FY 1999 PB	5,734	5,310	826	Cont

(U) Change Summary Explanation:

Funding: Changes in this project since the previous President's Budget are due to priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602102F, Materials.
- (U) PE 0602601F, Phillips Laboratory.
- (U) PE 0603410F, Space Systems Environmental Interactions Technology.
- (U) PE 0603605F, Advanced Weapons Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 4599
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4599 Reusable Launch Vehicle Technology	9,579	11,715	0	0	0	0	0	TBD	TBD

(U) A. Mission Description and Budget Item Justification: This project funds development of technologies for advanced and innovative low-cost launch vehicles and orbit transfer vehicles. This Air Force Reusable Launch Vehicle (RLV) technology project directly complements and leverages off of the National Aeronautics and Space Administration (NASA)-led RLV program. The spending plan has also been coordinated and approved by NASA Headquarters. The tasks identified in this project summary represent the DoD stake in RLV technology development as recommended by the Space Launch Modernization Plan (SLMP) study. In FY 1998, Congress added \$5M for low-cost launch vehicle technology development and \$7.5M for the Solar Thermionic Orbit Transfer Vehicle (SOTV) to this project.

(U) FY 1997 (\$ in Thousands):

- (U) \$6,705 Applied advanced military unique technologies to reusable launch vehicles.
 - (U) Began development of an integrated technology testbed to coordinate technology development.
- (U) \$958 Performed technology development for upperstages as they apply to reusable launch vehicles.
 - (U) Continued development of concepts and military unique technologies for use in an upperstage.
- (U) \$1,916 Executed and coordinated the Department of Defense reusable launch vehicle program including coordination with NASA's X-33 program and analysis of military applications.
- (U) \$9,579 Total

(U) FY 1998(\$ in Thousands):

- (U) \$1,406 Develop low-cost, reliable, launch vehicle technologies.
 - (U) Continue systems engineering effort for the SR-2 testbed vehicle.
 - (U) Build and conduct ground demonstration of Hydroxyl Amine Nitrate - Tri-Ethanol Amine Nitrate (HAN TEAN) flight weight gas generator.
 - (U) Build and conduct ground demonstration of POD separation devices.
 - (U) Design, fabricate, and test five foot linerless poly Dicyclopentadiene (DCPD) resin liquid oxygen tank
- (U) \$3,280 Conduct suborbital flight tests of low-cost launch technologies.
 - (U) Perform series of flight tests and evaluate performance of the SR-1 low-cost launch technology testbed vehicle.
 - (U) Reengineer SR-1 testbed vehicle, incorporating "lessons learned" from initial flight test experience.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603401F Advanced Spacecraft Technology	4599
<p>– (U) \$7,029 Develop technologies for upperstages that can operate as orbit transfer vehicles.</p> <ul style="list-style-type: none">– (U) Continue development of radiation hardened thermionic energy conversion device.– (U) Continue development of rigid deployable solar concentrator technology.– (U) Continue development of lightweight cryogenic propellant storage tank.– (U) Continue development of high-power electric energy generation subsystem.– (U) Continue development of high specific impulse orbit transfer propulsion system. <p>– (U) \$11,715 Total</p> <p>(U) <u>FY 1999</u>: Not Applicable.</p>		
Project 4599	Page 22 of 27 Pages	Exhibit R-2 (PE 0603401F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 4599																
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">9,579</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">9,579</td> <td style="text-align: center;">11,715</td> <td style="text-align: center;">0</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Congress added \$10 million in FY 1997 for Reusable Launch Vehicle technology. In FY 1998, Congress added \$5 million for low-cost launch vehicle technology and \$7.5 million for the Solar Thermionic Orbit Transfer Vehicle.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) Related Activities:</p> <ul style="list-style-type: none"> - (U) PE 0602102F, Materials. - (U) PE 0602269F, Hypersonic Technology Program. - (U) PE 0602601F, Phillips Laboratory. - (U) PE 0603302F, Space and Missile Launch Technology. - (U) PE 0603853F, Evolved Expendable Launch Vehicle Program. - (U) UPN 242, National Aeronautics and Space Administration (NASA) Reusable Launch Vehicle Program. - (U) This project has been coordinated through the Reliance process and with NASA to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	9,579	0	0	TBD	(U) Current Budget Submit/FY 1999 PB	9,579	11,715	0	TBD
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>														
(U) Previous President's Budget (FY 1998 PB)	9,579	0	0	TBD														
(U) Current Budget Submit/FY 1999 PB	9,579	11,715	0	TBD														
Project 4599	<i>Page 23 of 27 Pages</i>		Exhibit R-2 (PE 0603401F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 682J
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
682J Space Power and Thermal Management Technology	4,555	3,778	4,768	5,961	7,700	7,366	7,524	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops and demonstrates compact, low-cost, spacecraft and ballistic missile power generation, storage, distribution, and thermal management technologies, including cryogenic cooling technologies. Power generation work focuses on lightweight, low-cost, low volume, and survivable solar cell arrays. Energy storage work focuses on lightweight nickel hydride (NiH₂) and sodium sulfur (NaS) spacecraft batteries and flywheel energy storage systems for extended (five-ten year) satellite missions. Power distribution efforts focus on producing lightweight, high efficiency, standardized power busses for use on future Air Force space programs. This project also funds the development and demonstration of the non-nuclear technologies associated with space nuclear power systems such as power conversion, conditioning, and power system thermal management. In addition, investigations into alternative technologies to increase space vehicle power subsystem performance, lifetime, survivability, and safety while reducing costs/risks. In FY 1995, the Air Force assumed responsibility for the Ballistic Missile Defense Organization's (BMDO's) goal to develop spacecraft thermal management technologies. Examples of this are cryogenic coolers necessary to maintain passive (e.g., infrared focal plane array) sensors in low-light backgrounds through this project.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 682J
(U) <u>FY 1997 (\$ in Thousands):</u>		
– (U) \$2,850	Developed space conventional power technologies such as advanced solar cells and arrays.	
	– (U) Demonstrated high voltage (45-130V) space-qualified 90% efficient power converters and 99% efficient solid state switches for power management and distribution system applications.	
	– (U) Continued development of 25% efficient alkali metal thermal to electric converter (AMTEC) cells.	
	– (U) Conducted life cycle testing of AMTEC cells.	
	– (U) Demonstrated more manufacturable 25% efficient space-qualified three-junction solar cell.	
	– (U) Designed and fabricated thermionic testbed power system components for evaluation.	
	– (U) Initiated multi-junction solar cell flight test program.	
– (U) \$1,330	Developed space vehicle conventional power technologies such as compact volume/weight batteries.	
	– (U) Continued NiH ₂ low earth orbit life testing.	
	– (U) Completed fabrication of Sodium Sulfur Battery Cell Flight Experiment for manifest on shuttle flight Space Transportation System 87 (STS-87) mission to be flown in November 1997.	
– (U) \$375	Developed space vehicle thermal management technology such as cryogenic coolers for infrared focal plane arrays.	
	– (U) Quantified single stage reverse Brayton cryocooler performance parameters and generated requirements for a 10K cryogenic cooler.	
– (U) \$4,555	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$2,494	Develop space conventional power technologies such as advanced solar cells and arrays.	
	– (U) Continue development of 25% efficient alkali metal thermal to electric converter (AMTEC) cells.	
	– (U) Complete technology transition of more manufacturable efficient space-qualified three-junction solar cell program.	
	– (U) Continue multi-junction solar cell flight test program.	
	– (U) Continue electrical characterization of three- and four-junction solar cells.	
– (U) \$331	Develop space vehicle conventional power technologies such as compact volume/weight batteries.	
	– (U) Continue Nickel Hydride battery low earth orbit life testing.	
	– (U) Complete demonstration of Sodium Sulfur Battery Cell with flight experiment on Space Transportation System 87 (STS-87).	
– (U) \$953	Develop space vehicle thermal management technology such as cryogenic coolers for infrared focal plane arrays.	
	– (U) Initiate preliminary design, critical design, and development of a prototype 10K cryogenic cooler for space application.	
– (U) \$3,778	Total	
Project 682J	Page 25 of 27 Pages	Exhibit R-2 (PE 0603401F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603401F Advanced Spacecraft Technology	PROJECT 682J
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,827 Develop space conventional power technologies such as advanced solar cells and arrays. <ul style="list-style-type: none"> - (U) Initiate advanced lightweight, high efficiency, radiation resistant concentrator solar array program. - (U) Initiate alkali metal thermal to electric converter (AMTEC) cell flight demonstration program. - (U) Continue multi-junction solar cell flight test program. - (U) Continue electrical characterization of three- and four-junction solar cells. - (U) \$814 Develop space vehicle conventional power technologies such as compact volume/weight batteries. <ul style="list-style-type: none"> - (U) Complete ten year NiH₂ low earth orbit life testing. - (U) Continue development of lightweight flywheel integrated power and attitude control systems (IPACS); initiate cooperative IPACS experiment on International Space Station scheduled for deployment in FY 2001. - (U) \$1,127 Develop space vehicle thermal management technology such as cryogenic coolers for infrared focal plane arrays. <ul style="list-style-type: none"> - (U) Fabricate and begin characterization of 10K cryogenic cooler for very long wavelength infrared space applications. - (U) \$4,768 Total 		
Project 682J	Page 26 of 27 Pages	Exhibit R-2 (PE 0603401F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603410F Space Systems Environmental Interactions Technology				PROJECT 2822	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2822 Space Environmental Impact Tests	2,528	3,012	3,457	3,718	3,755	3,850	3,952	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1998, Projects 2822, Space Environmental Impact Test, and 2823, Space Hazards Mitigation, were combined under Project 2822. For clarity, the funding for FY 1997 reflects this consolidation.

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program's objectives are to improve the survivability and reliability of current and future DoD space systems, expedite the transfer of new technologies into military weapon systems hardware, and develop and demonstrate cost-effective solutions to mitigate hazardous space-environmental interactions that degrade spacecraft operations. Advanced technology goals include: (1) development of an autonomous active charge control system to prevent charge buildup on high-altitude spacecraft; (2) development of a compact environmental anomaly sensor to provide real-time warning to satellites of space-environmental conditions likely to cause anomalous operations; (3) improved specifications for use of advanced microelectronic components and solar array technologies in the space radiation environment; and (4) demonstration in space of small, low power, high performance space environmental sensors with potential application aboard current and future operational spacecraft. These goals will be achieved through (1) analysis of data from current and past experiments such as the Charge Control System (demonstrates active mitigation of spacecraft charging hazards), the Charging Hazards and Wake Studies experiment (determined space environmental hazards to exposed high voltages), the Shuttle Potential and Return Electrons Experiment (investigated the effect of high current electron beams on the ambient space environment), the Space Waves in Plasmas Experiment (looked at space effects on high-frequency radio transmissions), and the Photovoltaic Array Space Power Plus Diagnostics experiment (assessed performance and high voltage interactions of select solar array technologies in the radiation environment); and (2) space flight of new experiments to extend these results and investigate areas of concern, including the Digital Ion Drift Meter experiment (will demonstrate the use of miniaturized components, an advanced compact design, and digital techniques for monitoring low energy charged particles in space), the Small On-Board Environmental Diagnostic Sensors experiment (will demonstrate a suite of miniaturized components for monitoring high energy charged particles in space), and radiation and high voltage interactions experiments (to assess the performance of advanced microelectronic components and solar array technologies under adverse space environmental conditions and demonstrate techniques for mitigating or eliminating the effects of these interactions).

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603410F Space Systems Environmental Interactions Technology	PROJECT 2822
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$1,615 Developed and tested miniaturized, low-power, high performance space sensors to measure hazardous charged particles responsible for long-term radiation dose effects, excess charge buildups, single event upsets, and degradation of DoD spacecraft systems. <ul style="list-style-type: none"> – (U) Completed data analysis from Charging Hazards and Wake Studies experiment and transitioned results to DoD space system designers. Data was used to improve low-earth environmental specifications and to validate charge analysis modeling codes. – (U) Delivered the first Digital Ion Drift Meter space plasma sensor (designed for use on the National Polar-orbiting Operational Environmental Satellite System and Comm/Nav Outage Forecast System) to the Space Test Program Office for integration on the STEP-4 spacecraft to space qualify this sensor for operational use. – (U) Began design of an upgraded Digital Ion Drift Meter for flight on the German CHallenging Microsatellite Project (CHAMP) geophysical satellite in 1999. This second qualification flight will exercise an instrument incorporating many design improvements with substantially increased capabilities. A production version of this instrument will provide near real-time space environmental information to DoD space weather forecasters for predicting conditions affecting spacecraft operations. – (U) Completed design and began fabrication of miniaturized, low-power electron and proton telescopes to monitor the space radiation environment aboard future DoD spacecraft. – (U) \$133 Demonstrated performance of next-generation solar array technologies in space before integrating them into future space systems. Characterize component interactions with natural environment. <ul style="list-style-type: none"> – (U) Completed analysis of Photovoltaic Array Space Power Plus Diagnostics data, and transitioned to DoD spacecraft designers technical specifications on high-voltage plasma interactions and advanced solar array radiation degradation for updating space power design guidelines and test standards. – (U) \$321 Determined vehicle charging and environmental interactions which will result in improved preventive measures to protect spacecraft from charging hazards. Developed enhanced analytical models of vehicle charging and spacecraft environmental interactions directly applicable to future high-powered space systems. <ul style="list-style-type: none"> – (U) Transitioned technology to DoD spacecraft designers to improve modeling codes for vehicle charging effects and environmental interactions. – (U) \$137 Determined the interactions between spacecraft and their environment that limit performance of long-range, high frequency communications and radar systems. <ul style="list-style-type: none"> – (U) Provided results of sounding rocket tests to DoD communication system designers for incorporation into design and performance standards used to counter scintillation (communications signal degradation) effects. 		
Project 2822	Page 2 of 6 Pages	Exhibit R-2 (PE 0603410F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603410F Space Systems Environmental Interactions Technology	
		PROJECT 2822
– (U) \$322	Developed and tested technologies to monitor and mitigate hazardous space environmental interactions. Demonstrated an autonomous, active charge control system to prevent hazardous charge buildup on high-altitude and geosynchronous orbit satellites to decrease circuitry upsets and component damage, and improve on-orbit reliability and performance. Demonstrate an autonomous, compact, lightweight, low-power instrument to monitor the space environment near a satellite and warn of hazardous conditions. <ul style="list-style-type: none"> – (U) Evaluated the data from the Defense Satellite Communications System flight, and obtained approval from the Program Office to continue operations for additional performance analysis. – (U) Completed fabrication and began testing of the Compact Environmental Anomaly Sensor that will be space qualified on the Space Test Program’s TSX-5 satellite. 	
– (U) \$2,528	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$2,500	Develop and test miniaturized, low-power, high performance space sensors to measure the hazardous charged particles responsible for long-term radiation dose effects, excess charge buildups, single event upsets, and degradation of DoD spacecraft systems. <ul style="list-style-type: none"> – (U) Support launch, on-orbit operations, and performance analysis of the Digital Ion Drift Meter space plasma sensor on the Space Test Program’s STEP-4 satellite. This space flight is the first of two to obtain space qualification of this sensor needed for operational use. – (U) Fabricate, test, and integrate an upgraded Digital Ion Drift Meter for a 1999 flight on the German CHAllenging Microsatellite Project (CHAMP) geophysical satellite. This will be the second qualification flight, with DIDM being in a more operationally realistic orbit. – (U) Fabricate miniaturized, low-power, proton and electron telescopes to monitor the space radiation environment aboard future DoD spacecraft. 	
– (U) \$181	Demonstrate performance of next-generation solar array and microelectronic component technologies in space before integrating them into future space systems. Characterize component interactions with natural environment. Demonstrate active and passive techniques for reducing or eliminating these effects on the system. <ul style="list-style-type: none"> – (U) Design spacecraft payload to test advanced solar array and microelectronic components susceptibility to total radiation dose, single event upsets, and charging induced interactions with the environment. Experiment results over a wide range of space environmental conditions will be used to develop improved design and performance specifications, so DoD spacecraft designers can develop more reliable and survivable systems. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603410F Space Systems Environmental Interactions Technology	2822
<ul style="list-style-type: none"> - (U) \$331 Develop and test technologies to monitor and mitigate hazardous space environmental interactions. Demonstrate an autonomous, active charge control system to prevent hazardous charge buildup on high-altitude and geosynchronous orbit satellites, to decrease circuitry upsets and component damage, and improve on-orbit reliability and performance. Demonstrate an autonomous, compact, lightweight, low-power instrument to monitor the space environment near a satellite and warn of hazardous conditions. <ul style="list-style-type: none"> - (U) Complete evaluation of the long-term performance on the Defense Satellite Communications System satellite and address operational utility and potential improvements for use aboard future operational spacecraft. - (U) Support launch, on-orbit operations, and performance analysis of the Compact Environmental Anomaly Sensor hazard-warning instrument on the Space Test Program TSX-5 satellite. - (U) Deliver two Compact Environmental Anomaly Sensors for flight on Spaced-Based Infrared Satellite (SBIRS) technology demonstrators. These sensors will be used to verify SBIRS radiation hardening. - (U) \$3,012 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,247 Develop and test miniaturized, low-power, high performance space sensors to measure hazardous charged particles responsible for long-term radiation dose effects, excess charge buildups, single event upsets, degradation of DoD spacecraft systems. <ul style="list-style-type: none"> - (U) Conduct on-orbit operations and performance analysis of the Digital Ion Drift Meter (DIDM) space plasma sensor on the Space Test Program's STEP-4 satellite to obtain the space qualification needed for operational use on national environmental monitoring satellites. - (U) Support launch, on-orbit operations, and performance analysis of the upgraded Digital Ion Drift Meter on the German CHALLENGING Microsatellite Project (CHAMP) geophysical satellite. This will be the second qualification flight, with DIDM being in a more operationally realistic orbit. - (U) Complete fabrication of miniaturized, low-power, electron and proton telescopes to monitor the space radiation environment aboard future DoD spacecraft. - (U) \$864 Demonstrate performance of next-generation solar array and microelectronic component technologies in space before integrating them into future space systems. Characterize component interactions with natural environment. Demonstrate active and passive techniques for reducing or eliminating these effects on the system. <ul style="list-style-type: none"> - (U) Begin fabrication of spacecraft payload to test advanced solar array and microelectronic components susceptibility to total radiation dose, single event upsets, and charging induced interactions with the environment. 		
Project 2822	Page 4 of 6 Pages	Exhibit R-2 (PE 0603410F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE PROJECT	
3 - Advanced Technology Development	0603410F Space Systems Environmental Interactions Technology 2822	
<ul style="list-style-type: none"> - (U) \$346 - (U) \$3,457 	<ul style="list-style-type: none"> Develop and test technologies to monitor and mitigate hazardous space environmental interactions. Demonstrate an autonomous, compact, lightweight, low-power instrument to monitor the space environment near a satellite and warn of hazardous conditions. - (U) Conduct operations and performance analysis of the Compact Environmental Anomaly Sensor hazard-warning instrument on the Space Test Program's TSX-5 satellite. - (U) Support launch, on-orbit operations, and performance analysis of the Compact Environmental Anomaly Sensor hazard-warning instrument on the United States/British Space Test Research Vehicle (STRV)-1C satellite. This second qualification flight will exercise instrument performance in a higher radiation environment than the flight on TSX-5. - (U) Support launch and on-orbit operations of two Compact Environmental Anomaly Sensors on the Space-Based Infrared Satellite (SBIRS) technology demonstrators. Total 	
Project 2822	<i>Page 5 of 6 Pages</i>	Exhibit R-2 (PE 0603410F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603601F Conventional Weapons Technology
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	25,279	21,622	23,244	23,983	23,848	24,189	24,607	Continuing	Continuing
670A Ordnance Technology	17,233	10,628	9,981	7,951	11,477	12,670	15,971	Continuing	Continuing
670B Guidance Technology	8,046	10,994	13,263	16,032	12,371	11,519	8,636	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1998, technologies related to Global Positioning System (GPS) guidance (i.e., differential GPS and anti-jam technologies) and highly agile missile flight control will be developed in Project 670B, Guidance Technology, rather than in Project 670A.

(U) A. **Mission Description and Budget Item Justification:** This Advanced Technology Development program develops and demonstrates conventional weapons technologies including guidance, ordnance, and aeromechanics. This program develops the following technologies: autonomous, adverse-weather advanced guidance seekers; fuzes; explosives; hard target warheads; bombs, submunitions, and their dispensing mechanisms; weapon airframes; and weapon technology integration for conventional weapons. Hardware/software are developed and evaluated to determine effectiveness and potential operational value.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603601F Conventional Weapons Technology
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>
(U) Previous President's Budget (FY 1998 PB)	23,754	26,227	23,712	<u>Cost</u>
(U) Appropriated Value	24,885	24,687		<u>Cont</u>
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-588	-1,072		
b. SBIR	-543	-493		
c. Omnibus/Other Above Threshold Reprogrammings	-323			
d. Below Threshold Reprogrammings	1,887			
e. Rescissions	-39			
f. Line Item Veto		-1,500		
(U) g. Adjustments to Budget Years Since FY 1998 PB			-468	
(U) Current Budget Submit/FY 1999 PB	25,279	21,622	23,244	<u>Cont</u>

(U) **Change Summary Explanation:**

Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:** Not Applicable.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603601F Conventional Weapons Technology				PROJECT 670A		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
670A Ordnance Technology	17,233	10,628	9,981	7,951	11,477	12,670	15,971	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops and demonstrates the effectiveness and operational utility of conventional (non-nuclear) ordnance technologies for current and future air-delivered weapons. The project develops the following technologies: fuzes; energetic, insensitive, and less sensitive explosives; hard target warheads; explosives, bombs, submunitions, and their dispensing mechanisms; weapon airframes and carriage; smart submunitions; and weapon ordnance subsystem integration.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$9,486 Develop advance air-delivered and submunition technologies for components and subsystems to increase performance, lethality, safety, affordability, and supportability. <ul style="list-style-type: none"> - (U) Completed flight test demonstration of a 250-pound class miniature munition. - (U) Completed delivery of antimateriel warheads for flight testing. - (U) Completed trade studies on dense metal case penetrating warhead. - (U) Completed in-house testing of an antimateriel submunition and fabrication of instrumented and live-fire units for flight testing to demonstrate advanced antimateriel submunition technology which is highly effective against all mobile ground targets. - (U) Completed testing of weapon concept for defeating biological weapons in storage facilities. - (U) \$7,747 Demonstrate advanced weapon airframe and carriage technologies for munitions and submunitions to demonstrate operational effectiveness. <ul style="list-style-type: none"> - (U) Integrated and ground-tested a Global Positioning System/Inertial Navigation System (GPS/INS) jam resistant receiver demonstration unit in a weapon flight test vehicle. - (U) Developed overall air-to-air missile concept and conducted technology trade studies. - (U) \$17,233 Total 										
Project 670A			Page 3 of 8 Pages			Exhibit R-2 (PE 0603601F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603601F Conventional Weapons Technology	PROJECT 670A
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,444 Develop advanced air-delivered munition technologies for components and subsystems to increase performance, lethality, safety, affordability, and supportability. <ul style="list-style-type: none"> - (U) Complete preliminary design and subscale testing for dense metal case penetrating weapon for defeating very hard targets. - (U) Perform testing of warhead payloads for neutralizing chemical and biological weapons in production and storage facilities. - (U) \$5,793 Demonstrate advanced weapon airframe and carriage technologies for munitions and submunitions to demonstrate operational effectiveness. <ul style="list-style-type: none"> - (U) Complete ground testing of suspension and release equipment for future fighter aircraft which will reduce size, weight, and supportability issues associated with conventional pyrotechnic racks, maximize weapon loadout, and reduce drag and radar cross section. - (U) Conduct integrated submunition ground testing. - (U) Complete initial design of a tactical Ladar Seeker for the Low-Cost Autonomous Attack System munition; develop initial design of a three-dimensional model matching automatic target recognition (ATR) algorithms. - (U) Complete design specifications for an affordable dispensing system that will provide large aircraft loadouts of small smart submunitions. - (U) \$1,391 Develop advanced ordnance, fuze, and initiation subsystem technologies for improved effectiveness against hard targets. <ul style="list-style-type: none"> - (U) Complete requirements study and conceptual design of a multi-event fuze for initiating simultaneous or sequential warhead events. - (U) \$10,628 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,783 Develop advanced air-delivered munition technologies for components and subsystems to increase performance, lethality, safety, affordability, and supportability. <ul style="list-style-type: none"> - (U) Complete detail design and conduct full-scale sled and flight testing for dense metal case penetrating weapon for defeating very hard targets. - (U) Perform detailed analysis and design of an integrated imaging infrared target detection device and directional warhead. - (U) \$6,473 Demonstrate advanced weapon airframe and carriage technologies for munitions and submunitions to demonstrate operational effectiveness <ul style="list-style-type: none"> - Complete design and fabrication of a tactical laser radar seeker for the Low-Cost Autonomous Attack System (LOCAAS) munition; complete design and laboratory testing of three-dimensional model matching automatic target recognition algorithms for the LOCAAS munition. - Complete design of a low-cost captive dispensing system that will permit large loadouts of small smart munitions on current and future aircraft. - (U) \$1,725 Develop advanced fuze and initiation subsystem technologies for improved effectiveness against hard targets. <ul style="list-style-type: none"> - (U) Complete design and component testing of a multi-event fuze for initiating simultaneous or sequential warhead events. 		
Project 670A	Page 4 of 8 Pages	Exhibit R-2 (PE 0603601F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603601F Conventional Weapons Technology	PROJECT 670A		
- (U) \$9,981 Total				
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>
(U) Previous President's Budget (FY 1998 PB)	15,638	11,403	10,182	Cont
(U) Current Budget Submit/FY 1999 PB	17,233	10,628	9,981	Cont
(U) Change Summary Explanation:				
Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
- (U) PE 0602602F, Conventional Munitions.				
- (U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.				
- (U) PE 0603792N, Advanced Technology Demonstrations.				
- (U) PE 0604407D, Joint Standoff Weapon.				
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603601F Conventional Weapons Technology				PROJECT 670B		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
670B	Guidance Technology	8,046	10,994	13,263	16,032	12,371	11,519	8,636	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops and demonstrates affordable, autonomous, and adverse-weather advanced guidance technologies for conventional armament. Objectives include: increased accuracy, adverse-weather operation; real-time targeting and battle damage assessment enhanced target classification/identification; standoff delivery munitions; detection and "lock-on" of reduced signature targets; improved survivability; more reliable system operation; improved countermeasure performance; highly agile weapon control and enhanced affordability.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,091 Developed and demonstrated affordable, autonomous, and adverse-weather advanced air-to-surface guidance technologies. <ul style="list-style-type: none"> - (U) Fabricated and ground-tested an optical correlator and laser radar for autonomous target identification in a cluttered environment. - (U) Fabricated and bench-tested an affordable, autonomous, adverse-weather capable, precision synthetic aperture radar seeker; integrated with GBU-15 guidance and control subsystems. - (U) Assessed degree of commonality of components across seekers designed for direct attack, submunition, and cruise missile operations; identified critical technical issues for each design; and focused development of critical component technologies for the direct attack munition seeker design to support testbed fabrication. - (U) \$955 Developed and demonstrated guidance technologies and affordable, reliable components to counter the next generation air-to-air threats. <ul style="list-style-type: none"> - (U) Conducted analyses on an advanced digital electronic processor for weapons seeker applications. - (U) \$8,046 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$6,744 Develop and demonstrate affordable, autonomous, and adverse-weather capable seeker/processor technologies. <ul style="list-style-type: none"> - (U) Complete ground-testing and captive flight test of an optical correlator and laser radar (LADAR) for autonomous target identification in a cluttered environment. - (U) Complete integration of the Synthetic Aperature Radar-guided GBU-15 with F-16; conduct captive flight test of an affordable, autonomous, adverse-weather capable, precision, synthetic aperture radar seeker. - (U) Complete development of required hardware and software for the technology brassboard seeker; produce detailed advanced solid state LADAR seeker design. 										
Project 670B		Page 6 of 8 Pages				Exhibit R-2 (PE 0603601F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603601F Conventional Weapons Technology	670B
<ul style="list-style-type: none"> - (U) \$2,046 Develop and demonstrate advanced flight control technologies capable of controlling and maneuvering highly agile flight vehicles. <ul style="list-style-type: none"> - (U) Develop overall program to demonstrate capabilities of conformal electronically scanned array seeker to be used in conjunction with advanced control technology. - (U) Develop an advanced digital electronic processor for weapons seeker; develop parallel algebraic logic technology. - Conduct wind tunnel tests to characterize aerodynamic characteristics of the test vehicle; initiate tactical missile concept development, avionics hardware design, and reaction jet control system design. - (U) \$2,204 Develop and demonstrate highly accurate reliable and affordable advanced guidance technologies. <ul style="list-style-type: none"> - (U) Define system requirements definition for an extended range, precision guided 250-pound miniaturized munition that provides the target penetration performance and effectiveness of a 2000-pound munition - (U) Conduct free-flight tests of a high anti-jam global positioning system/inertial navigation system guided weapon to demonstrate performance in high jam environments. - (U) \$10,994 Total 		
(U) FY 1999 (\$ in Thousands):		
<ul style="list-style-type: none"> - (U) \$7,615 Develop and demonstrate affordable, autonomous, and adverse-weather capable seeker/processor technologies. <ul style="list-style-type: none"> - (U) Conduct free-flight demonstrations of an affordable, autonomous, adverse-weather capable, precision synthetic aperture radar seeker. - (U) Fabricate an advanced solid state laser radar seeker; develop captive flight plan for FY 2000 tests. - (U) Begin development of a conformal electronically scanned array seeker design to provide instantaneously accessible large field-of-regard. - (U) \$2,648 Develop and demonstrate advanced flight control technologies capable of controlling and maneuvering highly agile flight vehicles. <ul style="list-style-type: none"> - Conduct extensive developmental ground tests and analysis of solenoid actuated, reaction jet weapon controls. - (U) \$3,000 Develop and demonstrate highly accurate reliable and affordable advanced guidance technologies. <ul style="list-style-type: none"> - (U) Complete design and fabrication for an extended range, precision guided 250-pound miniaturized munition that provides the target penetration performance and lethality of a 2000-pound munition; initiate aircraft integration efforts to prepare for flight tests. - (U) \$13,263 Total 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603601F Conventional Weapons Technology	PROJECT 670B
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	8,116	14,824	13,530	Cont
(U) Current Budget Submit/FY 1999 PB	8,046	10,994	13,263	Cont

(U) **Change Summary Explanation:**

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0602111N, Anti-Air/Anti-Surface Warfare Technology.
- (U) PE 0603792N, Advanced Technology Demonstrations.
- (U) PE 0604618F, Joint Direct Attack Munitions.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603605F Advanced Weapons Technology
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	55,467	50,832	40,153	40,138	39,975	39,810	41,855	Continuing	Continuing
3150 Advanced Optics Technology	11,423	16,506	1,362	1,674	2,549	2,625	2,712	Continuing	Continuing
3151 High Power Semiconductor Laser Technology	4,336	5,850	9,845	11,175	9,508	9,793	10,118	Continuing	Continuing
3152 High Power Microwave Technology	14,323	6,955	7,373	7,419	8,332	8,557	8,781	Continuing	Continuing
3647 High Energy Laser Technology	25,385	21,521	21,573	19,870	19,586	18,835	20,244	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program demonstrates advanced directed energy and optical imaging concepts. Speed-of-light weapons and long-range, high resolution optical imaging through the turbulent atmosphere offer significant payoffs for many Air Force missions, such as theater missile defense, suppression of enemy air defenses, and control of space. This program has already demonstrated many major technological breakthroughs such as removing significant atmospheric distortions from optical transmissions (e.g., laser beams) and producing small, relatively high power laser diode phased arrays. Major emphasis areas include: high power microwave and high energy laser technologies; long-range optical imaging; and high power laser diodes and diode arrays. Because of the unique effects associated with high power microwaves there are many potential applications ranging from low power disruptions to high power destruction of electronic devices. Thus, a wide range of high power microwave technologies are being developed. Within high energy lasers the emphasis is on developing methods to increase the power on target. This is done by continuing to remove more of the atmospheric degradations and to develop more efficient laser devices. Long-range optical imaging offers high resolution images of space objects from the ground for applications such as satellite status assessments. High power diodes offer great potential for very small optical sources at many wavelengths for applications such as infrared illuminators and infrared countermeasure sources as well as high data rate secure communications. This PE will continue to develop a wide range of directed energy technologies for many DoD applications. Note: Congress added \$10 million for space laser imaging and \$6 million for Field Laser Demonstrator upgrades in FY 1998 which explains the perceived decrease in FYs 1999 and out.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603605F Advanced Weapons Technology
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	54,027	41,238	41,660	Cont
(U) Appropriated Value	56,895	55,238		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,723	-3,629		
b. SBIR	-1,145	-777		
c. Omnibus/Other Above Threshold Reprogrammings	-97			
d. Below Threshold Reprogrammings	1,627			
e. Rescissions	-90			
(U) Adjustments to Budget Year Since FY 1998 PB			-1,507	
(U) Current Budget Submit/FY 1999 PB	55,467	50,832	40,153	Cont

(U) Change Summary Explanation:

Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary: Not Applicable.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603605F Advanced Weapons Technology				PROJECT 3150				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3150 Advanced Optics Technology				11,423	16,506	1,362	1,674	2,549	2,625	2,712	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: This project develops advanced optical technologies for locating, identifying, and analyzing distant and/or dim objects. This work supports high energy laser technologies because an imaging subsystem is required for target verification, accurate and sustainable laser beam placement on target, and near-real-time damage assessment. Several advanced technologies including nonlinear optics, adaptive optics, and specialized signal processing are being developed. The goal is high quality optical image reconstruction, concentrating on removing turbulent atmosphere-induced distortions. Many of the technologies developed/being developed have significant application to astronomy research.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$680 Develop and demonstrate advanced optical imaging technologies that support applications such as space object imaging. <ul style="list-style-type: none"> - (U) Transitioned technology for daytime imaging of low-earth orbit satellites to the Maui Space Surveillance System 3.67 meter telescope. This capability dramatically increases the number of satellites imaged each day. - (U) \$309 Develop nonlinear optics technologies for non-mechanical corrections in optical imaging. <ul style="list-style-type: none"> - (U) Constructed, characterized, and demonstrated a laboratory breadboard of the telescope subsystem for an ultra-high resolution, lightweight imaging satellite telescope concept which uses nonlinear optics to compensate for deformations in a large diameter deployable primary mirror. - (U) \$844 Develop and demonstrate advanced, very long-range optical imaging technologies which increase resolution and data fusion to support missions such as space object identification and ground target identification from space. <ul style="list-style-type: none"> (U) Began development of field hardware to demonstrate feasibility of long-range optical imaging for space object identification/mission payload assessment, extending our reach, for the first time, to geosynchronous altitudes. - (U) \$9,590 Develop technologies for active imaging of geosynchronous space objects. <ul style="list-style-type: none"> - (U) Conducted active imaging field tests and demonstrations. - (U) \$11,423 Total 												
Project 3150				Page 3 of 19 Pages				Exhibit R-2 (PE 0603605F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603605F Advanced Weapons Technology	3150
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$845 Develop and demonstrate advanced, very long-range optical imaging technologies which increase resolution and data fusion to support missions such as space object identification and ground target identification from space. <ul style="list-style-type: none"> - (U) Continue development of field hardware to demonstrate feasibility of long-range passive optical imaging for space object identification/mission payload assessment, extending our reach, for the first time, to geosynchronous altitudes. - (U) Demonstrate target identification using multispectral images from space to improve battle damage assessment and allow imagery of targets under all types of camouflage while reducing satellite size, weight, and cost. - (U) \$514 Develop nonlinear optics technologies for non-mechanical corrections in optical imaging. <ul style="list-style-type: none"> - (U) Design and model a brassboard based on the FY 1997 telescope subsystem breadboard for characterization in a space environmental chamber to evaluate operational properties. - (U) \$233 Develop and demonstrate signature technology for identifying and assessing health and status of satellites out to geosynchronous orbit. <ul style="list-style-type: none"> -- (U) Complete analysis and initiate field experiments to demonstrate spectral classification and status of satellites. - (U) \$9,321 Develop technologies for active imaging of geosynchronous space objects. <ul style="list-style-type: none"> - (U) Conduct active imaging field tests and demonstrations. - (U) \$5,593 Upgrade the Field Laser Demonstrator for increased resolution. <ul style="list-style-type: none"> - (U) Develop hardware and techniques to obtain very accurate data on space objects (position, velocity, etc) and techniques for remote sensing of the atmosphere (detect hazardous agents, etc). - (U) \$16,506 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$618 Develop and demonstrate advanced technologies which increase resolution and data fusion for very long-range optical imaging to support missions such as space object identification and ground target identification from space. <ul style="list-style-type: none"> - (U) Continue development of field hardware to demonstrate feasibility of long-range passive optical imaging for space object identification/mission payload assessment, extending our reach, for the first time, to geosynchronous altitudes. - (U) \$548 Develop nonlinear optics technologies for non-mechanical corrections in optical imaging. <ul style="list-style-type: none"> - (U) Construct the ultra-high resolution, lightweight imaging satellite telescope brassboard designed in FY 1998 and evaluate in a space environmental chamber to determine actual capabilities. - (U) \$196 Develop and demonstrate signature technology for identifying and assessing health and status of satellites out to geosynchronous orbit. <ul style="list-style-type: none"> - Demonstrate utility of spectral classification and operational status analysis of satellites from data collected with the Ground-Based Electro-Optical Deep Space Surveillance test site. - (U) \$1,362 Total 		
Project 3150	Page 4 of 19 Pages	Exhibit R-2 (PE 0603605F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603605F Advanced Weapons Technology				PROJECT 3151				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3151	High Power Semiconductor Laser Technology			4,336	5,850	9,845	11,175	9,508	9,793	10,118	Continuing	Continuing
<p>(U) A. Mission Description and Budget Item Justification: This project continues to yield revolutionary breakthroughs in compact, robust, and affordable laser system technology for a wide range of military applications requiring small compact laser sources with low to moderate optical power. This is a long-term technology development project with both near-term and long-term goals. Near-term goals include developing compact, reliable infrared sources for a range of applications including night vision systems, landing zone markers, remote sensing, and covert communication systems. Longer-term goals focus on producing compact, significantly higher power sources for military applications including aircraft protection. This project leads the development of and builds upon a wide range of commercial advancements. Commercially available semiconductor lasers are widely used due to their low-cost, small size and weight, high reliability, and high efficiency in converting electricity to laser energy. This project preserves these attractive features while continually scaling output to higher powers/efficiencies and/or to military application-specific wavelengths. The project is divided into three technology areas. The first area investigates methods to increase output power from individual laser diodes while increasing power density onto a small spot. Secondly, semiconductor laser array integration methods, which produce a single, high quality laser beam at significantly higher power levels are developed. Thirdly, wavelength-specific laser diodes for military applications are developed. Project scientists/managers also work directly with field users to develop proof-of-capability demonstrations and field tests for these revolutionary laser sources. This technology has many commercial applications, especially for eye-safe lasers.</p> <p>(U) FY 1997 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$2,360 Develop laser diodes for improved performance/higher power in near-term applications such as illumination, designation, and communication and for incorporation into laser diode array architectures. <ul style="list-style-type: none"> - (U) Demonstrated four watts of continuous wave output power from a single-mode fiber, improving current semiconductor laser state-of-the-art by a factor of 1.5. This demonstration identified technical issues which must be solved to reach higher power levels for increased space laser communication data rates and increased system security. - (U) Demonstrated devices that have the potential to be modulated and scaled to high powers. - (U) \$1,071 Develop laser diode arrays for improved performance/higher power in applications requiring high power levels and beam quality such as designating and tracking for Airborne Laser (ABL) and Ground-Based Laser (GBL). <ul style="list-style-type: none"> - (U) Developed phasing methods for the 200 watt continuous output power diode laser array developed in FY 1996. - (U) \$905 Demonstrate high power laser diode array technology that incorporates size limitations necessary for integration into system application designs. <ul style="list-style-type: none"> - (U) Demonstrated 200 watts continuous wave output power from a one cubic foot laser head. This laser design demonstrated the feasibility of a compact, high-power laser system. - (U) \$4,336 Total 												
Project 3151				Page 6 of 19 Pages				Exhibit R-2 (PE 0603605F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603605F Advanced Weapons Technology	PROJECT 3151
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li> <p>– (U) \$1,386 Develop laser diodes for improved performance/higher power as sources in near-term applications such as infrared countermeasures, illumination, designation, and communication and for incorporation into laser diode array architectures.</p> <ul style="list-style-type: none"> <li>– (U) Identify and resolve reliability and failure mode issues to validate advanced high power, reliable, long-life diode lasers operating at 980 nanometers wavelength. <li>– (U) Demonstrate one watt, continuous wave, diffraction-limited output power at 1.55 micrometers wavelength to extend the capabilities of current and future communication systems and enhance eye-safe sources. <li> <p>– (U) \$979 Develop coherent laser diode arrays for improved performance/higher power as sources in applications requiring high power levels.</p> <ul style="list-style-type: none"> <li>– (U) Evaluate design and trade off decisions related to high power semiconductor diode array ruggedness, compactness, and portability for integration into system application designs. <li> <p>– (U) \$1,660 Develop semiconductor diode lasers and optically-pumped semiconductor lasers to support current advanced infrared countermeasures (IRCM) system upgrades to tactical fixed and rotary-wing aircraft. Development will focus on concepts with the potential for high efficient, compact infrared laser sources covering Bands 2 and 4.</p> <ul style="list-style-type: none"> <li>– (U) Demonstrate one watt coherent peak output power at quasi-continuous wave operation from a single, Band 2 semiconductor diode at an operating temperature of 200 degrees Kelvin. This device will demonstrate the necessary powers needed to jam Band 2 infrared surface-to-air missiles. <li>– (U) Demonstrate two watts coherent peak output power at quasi-continuous wave operation from a single, Band 4 optically-pumped semiconductor laser at an operating temperature of 85 degrees Kelvin. The collected data will demonstrate the necessary powers needed to jam Band 4 infrared surface-to-air missiles. <li> <p>– (U) \$1,825 Develop the basic laser source and target coupling technology needed to damage/destroy missile seeker components of next generation imaging advanced infrared guided air-to-air and surface-to-air missiles.</p> <ul style="list-style-type: none"> <li>– (U) Construct a first generation surrogate imaging threat to be used in laboratory testing. This surrogate is necessary as the availability of real world missile seeker assets to be used in destructive testing is severely limited and cost prohibitive. <li>– (U) Demonstrate damage to representative focal plane array, the detector used in an imaging missile, from illumination with moderate power pulsed laser device. <li> <p>– (U) \$5,850 Total</p> 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603605F Advanced Weapons Technology	3151
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,869 Develop laser diodes for improved performance/higher power as sources in near-term applications such as illumination, designation, and communication and for incorporation into laser diode array architectures. <ul style="list-style-type: none"> - (U) Demonstrate a factor of three increase (three watts) in continuous wave, diffraction limited output power at 1.55 micrometers wavelength to enable new system concepts for communications. - (U) Identify and resolve reliability and failure mode issues to validate advanced high-power, reliable long-life diode laser systems operating at 1.55 micrometers wavelength. - (U) \$1,127 Develop scaleable laser arrays (fiber/diode) for improved performance in applications requiring high power levels and beam quality such as designating/tracking sources for the airborne laser and ground based laser applications and as weapon sources for degrade and damage in aircraft self-protection applications. <ul style="list-style-type: none"> - (U) Demonstrate a fieldable 0.1 cubic foot, 100 watt, steerable near-infrared building block laser array head. This array will demonstrate the practicality for scaling to the multi-kilowatt power levels required for next generation weapons systems. - (U) \$3,908 Develop semiconductor diode lasers and optically-pumped semiconductor lasers to support current advanced infrared countermeasures (IRCM) system upgrades to tactical fixed and rotary-winged aircraft. Development will focus on concepts with the potential for high efficiency, compact infrared laser sources covering Bands 2 and 4. <ul style="list-style-type: none"> - (U) Demonstrate one watt peak output power from a Band 2 semiconductor laser at an operating temperature of 200 degrees Kelvin with a beam quality compatible with the DoD tri-Service Advanced Threat IRCM (ATIRCM) system. This demonstration will provide the necessary beam quality needed to directionally focus power downrange and jam Band 2 infrared surface-to-air missiles. - (U) Demonstrate two watts peak output from a Band 4 optically-pumped semiconductor laser at an operating temperature of 85 degrees Kelvin with a beam quality compatible with the DoD tri-Service ATIRCM system. This device will demonstrate the necessary beam quality needed to directionally focus the power downrange and jam Band 4 surface-to-air missiles. - (U) \$2,941 Develop the basic laser source and target coupling technology needed to damage/destroy missile seeker components of next generation imaging advanced infrared guided air-to-air and surface-to-air missiles. <ul style="list-style-type: none"> - (U) In a static field test, demonstrate damage to seeker of the first generation surrogate imaging threat sufficient to cause the missile to miss the target aircraft. - (U) Perform hardware-in-the-loop testing of damage mechanisms within the surrogate imaging threat. This testing will verify that damage caused in the static field test is sufficient to cause surrogate system malfunction, and that a missile guidance system would be sufficiently degraded to cause a low probability of missile impact with the target aircraft. - (U) Construct an improved surrogate threat to be used in laboratory testing. This surrogate, to be ready for testing in FY 2000, will be of higher fidelity than the first generation surrogate developed in FY 1998. - (U) \$9,845 Total 		
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603605F Advanced Weapons Technology	PROJECT 3152
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3152 High Power Microwave Technology	14,323	6,955	7,373	7,419	8,332	8,557	8,781	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops high power microwave generation technologies. It also develops a susceptibility/vulnerability/lethality data base to identify potential vulnerabilities of U.S. systems to high power microwave threats and to provide a basis for future offensive and defensive weapons system decisions. Representative U.S. and foreign assets will be tested to understand real system susceptibilities. Both wideband (wide frequency range) and narrowband (very small frequency range) technologies are being developed. The technologies developed in this project will demonstrate the applicability of high power microwaves that can damage/degrade/deny/destroy electronic systems and subsystems for missions such as suppression of enemy air defense, command and control warfare, and aircraft self-protection.

- (U) FY 1997 (\$ in Thousands):**
- (U) \$3,125 Develop suppression of enemy air defense technologies.
 - (U) Conducted experiments on selected integrated air defense assets.
 - (U) Completed detailed systems engineering specifications for high power microwave suppression of enemy air defenses weapon concept.
 - (U) Completed explosive pulse power development for suppression of enemy air defenses weapon concept.
 - (U) Completed source development for suppression of enemy air defenses weapon concept.
 - (U) \$3,004 Develop aircraft self-protection technologies.
 - (U) Completed high power microwave hardening criteria evaluation for large U.S. aircraft.
 - (U) Completed required electromagnetic hardening on range assets used for technology demonstration field test.
 - (U) Continued development of wideband high power microwave brassboard for field demonstrations.
 - (U) Conducted laboratory experiments on missiles to identify alternative/enhanced kill mechanisms.
 - (U) Completed technology demonstration field test planning.
 - (U) Initiated plan to transition technology to large aircraft system program offices.
 - (U) \$1,168 Develop command and control warfare technologies.
 - (U) Continued equipment characterization of command and control assets.
 - (U) Expanded propagation studies and models for various construction materials/techniques.
 - (U) Continued development of wideband sources and antennas for command and control warfare applications.
 - (U) Initiated studies of potential delivery and implementation techniques.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603605F Advanced Weapons Technology	3152
<ul style="list-style-type: none"> - (U) \$4,795 Develop laser-induced microwave emissions technology. <ul style="list-style-type: none"> - (U) Validated the integrated response model of the laser-induced microwave emission phenomenon. - (U) Completed experiments, begun in FY 1996, on operational systems and developed draft hardening specifications. - (U) Completed feasibility experiments and analyzed results for various applications. - (U) \$500 Develop active denial technology. <ul style="list-style-type: none"> - (U) Began application concept studies for next-generation technology. - (U) \$ 1,731 Develop high power microwave space control technologies. <ul style="list-style-type: none"> - (U) Completed concept study threat basing mode analysis. - (U) Performed subsystem and component level susceptibility experiments on satellite communication, imaging, and control technologies. - (U) Evaluated source technologies for threat demonstration. - (U) \$14,323 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,014 Develop suppression of enemy air defense technologies. <ul style="list-style-type: none"> - (U) Conduct critical experiments of integrated pulsed power generator and high power microwave source. - (U) Conduct subsystem level effects test of an integrated air defense asset. - (U) Start engineering design of high power microwave suppression of enemy air defenses weapon brassboard. - (U) \$2,271 Develop technologies to support advanced tactical applications. <ul style="list-style-type: none"> - (U) Complete wideband high power microwave brassboard for technology demonstration field test. - (U) Conduct field experiments for demonstrate self-protect technology. - (U) Complete plan to transition technology to large aircraft systems program office. - (U) Final assessment of wideband high power microwave technology's ability to effectively counter missile threats prior to transition to large aircraft system program offices. - (U) \$1,198 Develop command and control warfare technologies. <ul style="list-style-type: none"> - (U) Expand equipment characterization experiments and effects database. - (U) Begin selection of wideband source and pulse power designs. - (U) Develop delivery and implementation options. - (U) \$472 Develop active denial technology. <ul style="list-style-type: none"> - (U) Continue application concept studies for next-generation technology. - (U) \$6,955 Total 		
Project 3152	Page 11 of 19 Pages	Exhibit R-2 (PE 0603605F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603605F Advanced Weapons Technology	3152
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,354 Develop suppression of enemy air defense technologies. <ul style="list-style-type: none"> - (U) Complete critical experiment of high power microwave suppression of enemy air defenses technologies. - (U) Continue to conduct experiments on selected integrated air defense assets. - (U) Initiate advanced repetitive source development for suppression of enemy air defenses. - (U) \$2,357 Develop technologies to support advanced tactical applications. <ul style="list-style-type: none"> - (U) Continue development of high power microwave sources and antennas for aircraft self-protect and other advanced tactical applications. - (U) Continue to assess candidate high power microwave weapon effects on U.S. and foreign systems and identify mitigation technologies. - (U) Begin to develop or adapt engagement models for candidate weapon systems. - (U) \$1,172 Develop command and control warfare technologies. <ul style="list-style-type: none"> - (U) Finalize first wideband source and pulse power design for ground control network application. - (U) Complete initial equipment characterization of command and control assets. - (U) Continue effects experiments on electromagnetic propagation into command and control facilities. - (U) \$490 Develop active denial technology. <ul style="list-style-type: none"> - (U) Continue application concept studies for next-generation technology. - (U) \$7,373 Total 		
Project 3152	<i>Page 12 of 19 Pages</i>	Exhibit R-2 (PE 0603605F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603605F Advanced Weapons Technology	PROJECT 3647
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3647 High Energy Laser Technology	25,385	21,521	21,573	19,870	19,586	18,835	20,244	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project provides for the development, demonstration, and detailed assessment of technology needed for high energy laser weapons. Near-term focus is on ground-based and airborne high energy laser missions, although the technology developed for this project is directly applicable to most high energy laser applications. Critical technologies demonstrated include: scaleable laser devices, with near-term emphasis on the Chemical Oxygen-Iodine Laser (COIL); optical components; and laser beam control to efficiently compensate and propagate laser radiation through the atmosphere to a target. Detailed computational models to establish high energy laser weapon effectiveness and satellite and missile vulnerability will be developed. Correcting the laser beam for distortions induced by propagation through the turbulent atmosphere is the key technology in most high energy laser applications. The beam control technology developed in this project has a significant benefit to the astronomy community.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,970 Develop and demonstrate high energy laser components for potential weapon applications.
 - (U) Identified specific energy loss mechanisms in chemical oxygen-iodine laser (COIL) devices, based on results of COIL diagnostic testing and modeling, and began development of advanced concepts to reduce losses and improve COIL device performance.
 - (U) Developed the magnetic gain switch hardware necessary to efficiently operate a COIL device as a repetitively-pulsed laser, a necessary step in using a wavelength-shifted COIL device in illuminator applications.
- (U) \$1,468 Perform vulnerability assessments on potential high energy laser targets to provide critical data for designing laser systems which can defeat a range of targets and to provide critical data for designing systems protected against laser threats.
 - (U) Continued to conduct laser vulnerability experiments on satellite subsystems.
 - (U) Continued to perform detailed vulnerability analysis on satellite optical payload systems.
 - (U) Continued detailed satellite vulnerability assessments on satellites using newly incorporated uncertainty methodology.
 - (U) Continued assessing the potential of near-term laser countermeasures on satellites.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603605F Advanced Weapons Technology PROJECT 3647	
<ul style="list-style-type: none"> - (U) \$10,120 	<p>Perform atmospheric compensation/beam control experiments from ground-based and airborne platforms to support applications ranging from weaponization to space object identification.</p> <ul style="list-style-type: none"> - (U) Began design of a two laser beacon system for full-scale atmospheric compensation on the 3.5 meter telescope. - (U) Demonstrated real-time compensation of atmospheric turbulence-induced distortions on satellite images. - (U) Installed 500 watt laser tracking illuminator system and began satellite active tracking experiments to evaluate synergistic effects with atmospheric compensation and demonstrate 24-hour satellite tracking. - (U) Completed integration of first-generation adaptive optics on Starfire Optical Range (SOR) 3.5 meter telescope and began imaging tests using stars. Testing results will identify hardware and software issues which need to be addressed to improve atmospheric compensation performance. - (U) Continued development of second-generation adaptive optics system to maximize resolution and compensation of the SOR 3.5 meter telescope. 	
<ul style="list-style-type: none"> - (U) \$10,827 	<p>Characterize atmospheric attenuation and distortion on laser beam propagation, conduct atmospheric compensation and beam control experiments, and develop an airborne ultra-precision inertial pointing system to enhance boost phase theater ballistic missile tracking.</p> <ul style="list-style-type: none"> - (U) Completed analysis and evaluation of global atmospheric optical data taken in FY 1995 airborne experiments. - (U) Collected atmospheric aerothermal data for strategic locations worldwide to develop parametric database for high energy laser operational assessments analysis. - (U) Correlated atmospheric aerothermal and optical parameters in an analytical model to provide a cost-effective method of determining laser weapon effectiveness against specific threats. - (U) Designed near full-scale acquisition, tracking, and pointing experiments to demonstrate and validate atmospheric compensation, tracking, and laser beam control techniques against fixed targets and boost phase theater ballistic missiles. The experiments were conducted at White Sands Missile Range, NM. - (U) Designed small-scale laboratory and field experiments to explore innovative atmospheric compensation, tracking, and laser beam control options reducing the technical risk of developing airborne high energy laser weapons. 	
<ul style="list-style-type: none"> - (U) \$25,385 	<p>Total</p>	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603605F Advanced Weapons Technology	PROJECT 3647
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,550 Develop and demonstrate high energy laser components for potential weapon applications. <ul style="list-style-type: none"> - (U) Increase fieldability of the Chemical Oxygen Iodine Laser (COIL) for airborne and ground-based weapon systems by examining new nozzle designs, transport gases, and cavity design to increase efficiency, and reduce size and weight. - (U) Demonstrate repetitively-pulsed COIL device suitable for use in wavelength-shifted COIL illuminator laser applications. - (U) Select Raman wavelength-shifting concept and begin design of laboratory hardware to demonstrate high average power when coupled with a repetitively-pulsed COIL device. - (U) \$1,822 Perform vulnerability assessments on potential high energy laser targets to provide critical data for designing laser systems which can defeat a range of targets and to provide critical data for designing systems protected against laser threats. <ul style="list-style-type: none"> - (U) Continue to conduct laser vulnerability experiments on satellite subsystems. - (U) Continue to perform detailed vulnerability analysis on satellite optical payload systems. - (U) Continue detailed satellite vulnerability assessments using newly incorporated uncertainty methodology. - (U) Continue assessing the potential of near-term laser countermeasures on satellites. - (U) \$914 Investigate and develop advanced, high energy laser optical components. <ul style="list-style-type: none"> - (U) Continue to develop and evaluate techniques to monitor optical components installed in future operational high-energy laser systems. - (U) Continue to optimize deposition techniques and characterization of low absorption, low-scatter optical thin film coatings for uncooled optics and other specialized applications. Transfer technology to industry for scaling. - (U) Build and evaluate the performance of a cooled, transmissive optical element in the Thermal Distortion Test Facility. Determine the distortion due to simulated high-energy laser heating. - (U) \$9,668 Perform atmospheric compensation and laser beam control experiments from ground-based platforms to support applications ranging from weaponization to space object identification. <ul style="list-style-type: none"> - (U) Complete design and begin development of two-laser beacon system for atmospheric compensation on the 3.5 meter telescope. - (U) Integrate second-generation adaptive optics system on 3.5 meter telescope to improve image quality of observed space objects. - (U) Continue satellite active tracking experiments to evaluate synergistic effects with atmospheric compensation and demonstrate 24-hour satellite acquisition and tracking capability. - (U) \$6,567 Characterize atmospheric attenuation and distortion on laser beam propagation, conduct atmospheric compensation and beam control experiments, and develop an airborne ultra-precision inertial pointing brassboard to enhance boost phase theater ballistic missile tracking. <ul style="list-style-type: none"> - (U) Conduct near full-scale tracking and pointing experiments that demonstrate and validate atmospheric compensation, tracking, and laser beam control techniques against fixed targets. The experiments will be conducted at White Sands Missile Range, NM. - (U) Conduct small-scale laboratory and field experiments to explore innovative atmospheric compensation, tracking, and laser beam control options reducing the technical risk of developing airborne high energy laser weapons. 		
Project 3647	Page 16 of 19 Pages	Exhibit R-2 (PE 0603605F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603605F Advanced Weapons Technology	PROJECT 3647
– (U) \$21,521	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$2,185	Develop and demonstrate high energy laser components for potential weapon applications.	
	– (U) Demonstrate improved performance and fieldability with the Chemical Oxygen Iodine Laser (COIL) and support enhanced transition to the Airborne Laser system acquisition program.	
	– (U) Demonstrate a repetitively pulsed, high average power, frequency-shifted COIL device for use as a target illuminator.	
	– (U) Conduct high power laser technology development to ensure operation control of space and the tactical and strategic theaters.	
– (U) \$1,693	Perform vulnerability assessments on potential high energy laser targets to provide critical data for designing laser systems which can defeat a range of targets and to provide critical data for designing systems protected against laser threats.	
	– (U) Continue to conduct laser vulnerability experiments on satellite subsystems.	
	– (U) Continue to perform detailed vulnerability analysis on satellite optical payload systems.	
	– (U) Continue detailed satellite vulnerability assessments using newly incorporated uncertainty methodology.	
	– (U) Continue assessing the potential of near-term laser countermeasures on satellites.	
– (U) \$746	Investigate and develop advanced, high energy laser optical components.	
	– (U) Continue to evaluate techniques to monitor optical components installed in a future operational high-energy laser systems. Transfer monitoring equipment to users. Such techniques are useful for predicting performance degradation and/or catastrophic failure of an optical component in an operational high energy laser system.	
	– (U) Continue to optimize very low absorption, low-scatter optical thin film coatings. Transfer technology to industry for scaling. Low absorption, low scatter, durable coatings are critical to the performance of uncooled optics planned for future high-energy laser systems.	
– (U) \$11,200	Perform atmospheric compensation and laser beam control experiments from ground-based platforms to support applications ranging from weaponization to space object identification.	
	– (U) Demonstrate atmospheric compensation of images using dual laser beacon system on 3.5 meter telescope.	
	– (U) Continue active satellite tracking to investigate phenomena resulting from satellite illumination at various engagement geometries.	
	– (U) Demonstrate compensated laser propagation to satellites on 3.5 meter telescope.	
	– (U) Use track jitter compensation with atmospheric compensation and active tracking to point a laser with sufficient accuracy to maintain a selected aimpoint on a satellite target.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603605F Advanced Weapons Technology	3647
<ul style="list-style-type: none"> - (U) \$5,749 Characterize atmospheric attenuation and distortion on laser beam propagation, conduct atmospheric compensation and beam control experiments, and develop an airborne ultra-precision inertial pointing brassboard to enhance boot phase theater ballistic missile tracking. <ul style="list-style-type: none"> - (U) Collect atmospheric aerothermal data for strategic locations worldwide to develop parametric database for high energy laser operational assessments analysis. - (U) Continue near full-scale acquisition, tracking, and pointing experiments that demonstrate and validate atmospheric compensation, target tracking, and laser beam control techniques against fixed targets and boost phase theater ballistic missiles. The experiments will be conducted at White Sands Missile Range, NM. - (U) Instrument an aircraft for use as a dynamic target in White Sands Missile Range, NM, atmospheric propagation experiments. The aircraft will gather data to support future Airborne Laser technology development/risk reduction experiments. - (U) Continue small-scale laboratory and field experiments to explore innovative atmospheric compensation, tracking, and laser beam control options reducing the technical risk of developing airborne high energy laser weapons. - (U) \$21,573 Total 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603605F Advanced Weapons Technology	PROJECT 3647															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">23,798</td> <td style="text-align: center;">25,758</td> <td style="text-align: center;">22,507</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">25,385</td> <td style="text-align: center;">21,521</td> <td style="text-align: center;">21,573</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0602601F, Phillips Laboratory. - (U) PE 0603319F, Airborne Laser Demonstration. - (U) PE 0305910F, Spacetrack. - (U) PE 0603217C, Ballistic Missile Defense, Advanced Development (High Altitude Balloon Experiment). - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	23,798	25,758	22,507	Cont	(U) Current Budget Submit/FY 1999 PB	25,385	21,521	21,573	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>													
(U) Previous President's Budget (FY 1998 PB)	23,798	25,758	22,507	Cont													
(U) Current Budget Submit/FY 1999 PB	25,385	21,521	21,573	Cont													
Project 3647	Page 19 of 19 Pages	Exhibit R-2 (PE 0603605F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603707F Weather Systems Technology	PROJECT 2688
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2688 Weather Support Technology	3,175	1,943	1,568	1,562	1,361	1,141	0	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1998, Projects 2688, Weather Support Technology, 2781, Weather Radar Technology, and 4026, Centralized Support Technology, were combined within Project 2688. For clarity, FY 1997 funding reflects this consolidation.

(U) A. Mission Description and Budget Item Justification: New technologies for weather support forces and their operational customers are demonstrated and transitioned to the user in this Advanced Technology Development program. Technologies developed include new weather impact decision aids that will be incorporated into mission planning systems and used by battlefield commanders for optimum selection of electro-optical systems and tactics to accomplish mission objectives. The program also provides new technologies to improve global/theater support capabilities at the Air Force’s Global Weather Center and Space Forecast Center. Improves the Air Force’s ability to integrate information for weather forecasts in battle areas where data is denied. Develops models for forecasting conditions in the earth’s neutral atmosphere, ionosphere, and magnetosphere which are needed to provide critical support to Air Force surveillance, communications, and other satellite assets. New global and theater weather forecast techniques that improve the Air Force’s capability to provide centralized weather data are also developed.

(U) FY 1997 (\$ in Thousands):

- (U) \$300 Developed Tactical Forecast System analysis and forecast technology.
(U) Completed development of artificial intelligence battlespace environment forecast model for in-theater operations.
- (U) \$1,554 Developed Battlespace Environment Impact Decision Aids.
 - (U) Delivered advanced physics Night Vision Goggle Operations Weather Software to Air Force Special Operations Command/Air Combat Command that permits aircrews to avoid terrain hazards.
 - (U) Evaluated infrared scene visualization system.
- (U) \$735 Completed and developed centralized battlespace environment support technology.
 - (U) Delivered cloud layer, aircraft icing, and turbulence diagnostic algorithms to Air Force Global Weather Center.
 - (U) Continued development of thunderstorm, aircraft icing, and turbulence diagnostic algorithms.
- (U) \$202 Developed space environmental algorithms.
 - (U) Developed integrated space environmental model for 55th Space Weather Squadron (Air Force Space Command).
- (U) \$384 Developed severe battlespace environment prediction software.
 - (U) Completed development of lightning algorithm for WSR-88D weather surveillance radar system.
- (U) \$3,175 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603707F Weather Systems Technology	PROJECT 2688
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$1,339	Develop Battlespace Environment Impact Decision Aids.	
	– (U) Develop and deliver Night Vision Goggle Operations Weather Software Version 4.0 which predicts impact of city lighting on detection ranges, to Air Force Special Operations Command (AFSOC)/Air Combat Command (ACC).	
	– (U) Transition infrared scene visualization system to Air Force Mission Support System Program Office at Electronic Systems Center.	
	– (U) Initiate development of new target acquisition software and mission impact modules for weather decision aids.	
– (U) \$498	Develop centralized weather support technology.	
	– (U) Deliver validated thunderstorm, aircraft icing, and turbulence diagnostic algorithms to Air Force Weather Agency (AFWA.)	
– (U) \$106	Develop space environmental algorithms.	
	– (U) Develop additional components for the integrated environmental model for Air Force Space Command.	
– (U) \$1,943	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
– (U) \$834	Develop software that predicts the impact of weather on precision guided munitions during mission execution for Air Combat Command.	
	– (U) Transition Target Acquisition Weather Software V1.0 to ACC for evaluation.	
– (U) \$628	Develop software to incorporate the impact of weather on precision guided munitions during preparation of the Air Tasking Order.	
	– (U) Demonstrate the value of Weather Automated Mission Planning Software to ACC.	
– (U) \$106	Develop software that predicts the impact of weather on night vision goggle detection ranges.	
	– (U) Transition Night Vision Goggle Operations Weather software V5.0 to ACC and AFSOC.	
– (U) \$1,568	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603707F Weather Systems Technology			PROJECT 2688
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	3,273	2,036	2,056	Cont
(U) Appropriated Value	3,406	2,036		
(U) Adjustments to Appropriated Value				
a. Congressional General Reductions	-71	-66		
b. SBIR	-62	-27		
c. Omnibus/Other Above Threshold Reprogrammings	-93			
d. Below Threshold Reprogrammings				
e. Rescissions	-5			
(U) Adjustments to Budget Year Since FY 1998 PB			-488	
(U) Current Budget Submit/FY 1999 PB	3,175	1,943	1,568	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) <u>Related Activities:</u>				
- (U) PE 0305160F, Defense Meteorological Satellite Program.				
- (U) PE 0305111F, Weather Service.				
- (U) PE 0602601F, Phillips Laboratory Exploratory Development.				
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
Project 2688 Page 3 of 3 Pages Exhibit R-2 (PE 0603707F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603723F Environmental Engineering Technology	PROJECT 2103
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2103 Environmental Quality Technology	7,412	3,786	2,663	3,202	1,431	2,458	0	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1998, Project 2103, Environmental Quality Technology, and Project 3037, Noise and Sonic Boom Impact Technology, are combined within Project 2103, Environmental Quality Technology. The total PE costs shown for FY 1997 reflect this consolidation.

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program develops and demonstrates advanced technologies to address Air Force-unique environmental problems and determines the effect of aircraft noise and sonic boom stimuli on humans, animals, and structures. Specific projects advance and integrate environmental issues and operating concerns into air base design, support, and maintenance. Develops and demonstrates advanced technologies to solve environmental restoration problems, reduce hazardous emissions from weapon systems, minimize Air Force industrial waste, and eliminate toxic pollutant releases from Air Force operations. Develops and demonstrates technologies to predict and evaluate the environmental impacts of noise from aircraft operations, as directed by the National Environmental Policy Act. Improving this capability aids in the timely response to public concerns, preparation of accurate environmental impact statements, and minimizing unfavorable legal challenges to Air Force operations.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603723F Environmental Engineering Technology	PROJECT 2103
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li> – (U) \$2,133 Demonstrated technologies and design criteria for improved monitoring, disposal, characterization, and assessment of risks to the environment posed by Air Force activities. <ul style="list-style-type: none"> <li>– (U) Completed development of advanced air monitoring technology and characterization of atmospheric diffusion following catastrophic space launch aborts to validate space launch toxic risk assessment models for Vandenberg AFB, CA. <li>– (U) Demonstrated additional in-place sensors and monitoring technologies to locate, identify, and monitor solvent contaminant sources and plumes; demonstrated direct push data point mapping and monitoring assessment using Global Positioning System (GPS) technology. <li>– (U) Provided full-scale field evaluation of techniques to determine remediation rates of fuel/solvent contaminants (including natural or enhanced biodegradation). <li> – (U) \$4,219 Demonstrated technologies to reduce/destroy wastes and contamination of the environment by Air Force materials and operations. <ul style="list-style-type: none"> <li>– (U) Completed design and began construction of an air recirculating paint booth with biofilter and Volatile Organic Compounds (VOCs) emissions control technology; continued to develop and demonstrate affordable technologies to control air polluting emissions from Air Force industrial processes (to comply with Clean Air Act amendments). <li>– (U) Developed cost-effective alternate processes and materials that reduce or eliminate the production of hazardous wastes and the use of hazardous materials; demonstrated non-chromate conversion coating on ion vapor deposition of aluminum; demonstrated spray casting as a replacement for cadmium/nickel plating. <li>– (U) Developed chemical/physical processes to treat oil/water wastes, emulsions, and aqueous film forming foam (AFFF) in waste water (including membrane separation, hydrogen peroxide treatment, direct nucleate flotation, and hydrothermal oxidation). <li> – (U) \$1,060 Developed and demonstrated noise effects assessment technology. <ul style="list-style-type: none"> <li>– (U) Initiated study on the extent of military overflight noise impacts on national parks. <li>– (U) Demonstrated the use of the animal noise monitor with GPS technology for assessment of the effects of military aircraft noise on free-ranging herd animals in military operating areas and on Air Force ranges. <li> – (U) \$7,412 Total <ul style="list-style-type: none"> <li>– (U) Developed model to determine the penetration of sonic booms into water for assessment of impacts on marine mammals. 		
Project 2103	Page 2 of 5 Pages	Exhibit R-2 (PE 0603723F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603723F Environmental Engineering Technology	PROJECT 2103
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$1,026 Demonstrate technologies and design criteria for improved monitoring, disposal, characterization, and assessment of risks to the environment posed by Air Force activities. <ul style="list-style-type: none"> – (U) Evaluate chemical fate and environmental transport of compounds of potential use to the Air Force or new to the Air Force inventory. – (U) Begin development of immunochemical detection systems to provide inexpensive, accurate, and robust measurements of Air Force toxic wastes. – (U) Begin adaptation of environmental sensor networks to air toxic monitoring. – (U) \$1,620 Demonstrate technologies to reduce/destroy wastes and contamination of the environment by Air Force materials and operations. <ul style="list-style-type: none"> – (U) Continue development of a recirculating paint booth with biofilter and Volatile Organic Compounds (VOCs) emissions control technology; continue to develop and demonstrate affordable technologies to control air pollutant emissions from Air Force industrial processes (to comply with Clean Air Act amendments). – (U) Continue to develop chemical/physical processes to treat oil/water wastes, emulsions, and aqueous film forming foam (AFFF) in waste water (including membrane separation, hydrogen peroxide treatment, direct nucleate flotation, and hydrothermal oxidation). – (U) Continue to develop cost-effective alternate processes and materials that reduce or eliminate the production of hazardous wastes and the use of hazardous materials. – (U) \$1,140 Develop and demonstrate noise effects assessment technology. <ul style="list-style-type: none"> – (U) Upgrade the Assessment System for Aircraft Noise (ASAN) with the ability to predict noise from military aircraft operating in subsonic military operating areas. – (U) Conduct study to determine the effect of sleep disturbance habituation from aircraft noise. – (U) Characterize the habitat of marine mammals exposed to military aircraft noise and develop baseline noise levels for Air Force use. – (U) \$3,786 Total 		
Project 2103	Page 3 of 5 Pages	Exhibit R-2 (PE 0603723F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603723F Environmental Engineering Technology	PROJECT 2103
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li>– (U) \$1,100 Develop and demonstrate technologies and design criteria for improved monitoring, disposal, characterization, and assessment of risks to the environment posed by Air Force activities. <ul style="list-style-type: none"> <li>– (U) Continue to evaluate chemical fate and environmental transport of compounds of potential use to the Air Force or new to the Air Force inventory. <li>– (U) Develop monitoring capabilities for integration with horizontal boring technology to characterize and monitor Dense Non-Aqueous Phase Liquid (DNAPL). <li>– (U) \$1,263 Demonstrate technologies to reduce/destroy wastes and contamination of the environment by Air Force materials and operations. <ul style="list-style-type: none"> <li>– (U) Demonstrate a full-scale emission control system based on recirculation and steady state biofiltration for use on paint booth exhausts. <li>– (U) Demonstrate the application of hydrothermal oxidation reactor technology, coupled with chemical/physical separation technologies, for the destruction of paint stripping wastes. <li>– (U) \$ 300 Complete development and demonstration of technologies to clean up a variety of chemically contaminated DoD sites. <ul style="list-style-type: none"> <li>– (U) Complete protocol for intrinsic remediation of chlorobenzenes and nitroluenes at chlorinated solvents contaminated sites. <li>– (U) \$2,663 Total 		
Project 2103	<i>Page 4 of 5 Pages</i>	Exhibit R-2 (PE 0603723F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)				DATE
BUDGET ACTIVITY				February 1998
3 - Advanced Technology Development		PE NUMBER AND TITLE		PROJECT
		0603723F Environmental Engineering Technology		2103
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>
				<u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	7,520	4,084	4,857	Cont
(U) Appropriated Value	7,885	4,084		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-181	-217		
b. SBIR	-184	-81		
c. Omnibus/Other Above Threshold Reprogrammings	-96			
d. Below Threshold Reprogrammings				
e. Rescissions	-12			
(U) Adjustments to Budget Year Since FY 1998 PB			-2,194	
(U) Current Budget Submit/ FY 1999 PB	7,412	3,786	2,663	
 (U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
 (U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
- (U) PE 0602102F, Materials.				
- (U) PE 0602202F, Armstrong Lab Exploratory Development.				
- (U) PE 0602203F, Aerospace Propulsion.				
- (U) PE 0603211F, Aerospace Structures.				
- (U) PE 0603231F, Crew Systems and Personnel Protection Technology.				
- (U) PE 0603716D, Strategic Environmental Research and Development Program.				
- (U) PE 0604706F, Life Support Systems.				
- (U) PE 0604708F, Other Operational Equipment.				
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.				
 (U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	8,167	9,364	11,025	11,295	6,606	6,722	6,901	Continuing	Continuing
2810 Advanced Image/Information/Optical Memory Technology Applications	6,168	4,593	5,849	5,634	6,606	6,722	6,901	Continuing	Continuing
2863 Integrated Photonics	1,999	4,771	5,176	5,661	0	0	0	0	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1998, Project 2810, Advanced Image/Information Applications, and Project 3192, Advanced Optical Memory Technology, were combined into Project 2810, Advanced Image/Information/Optical Memory Technology Applications, within this PE. The total PE cost shown for FY 1997 reflects this consolidation.

(U) A. **Mission Description and Budget Item Justification:** This Advanced Technology Development program develops and demonstrates Command, Control, and Communications (C3) technologies in the areas of processing and fusion of digital databases, photonics technology, optical disk storage/processing of digital information, and distributed processing technology for interoperability between dispersed command centers. These technologies provide increased storage, processing, and transmission of digital data received from a broad variety of sensors and sources. Note: In FY 1998 and out, additional emphasis has been placed on advanced subsystems integration and information warfare technologies to meet future user requirements.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development		PE NUMBER AND TITLE 0603726F C3 Subsystem Integration		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	8,390	9,922	10,566	Cont
(U) Appropriated Value	8,777	9,922		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-184	-324		
b. SBIR	-203	-234		
c. Omnibus/Other Above Threshold Reprogrammings	-209			
d. Below Threshold Reprogrammings				
e. Rescissions	-14			
(U) Other Adjustments to Budget Years Since FY 1998 PB			459	
(U) Current Budget Submit/FY 1999 PB	8,167	9,364	11,025	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to increased emphasis on Advanced Image/Information/Optical Memory technology applications within the Science and Technology (S&T) Program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603726F C3 Subsystem Integration				PROJECT 2810		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2810 Advanced Image/Information/Optical Memory Technology Applications	6,168	4,593	5,849	5,634	6,606	6,722	6,901	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops and demonstrates techniques and algorithms to meet weapon systems requirements for processed and fused multi-source information required for mission planning, navigation, targeting, and terrain analysis. It provides generic language translation processing techniques, and state-of-the-art algorithms for Air Force exploitation of digitally processed image and spatial (i.e., latitude, longitude, and elevation) database products, as well as develop automated capabilities to reference and display hypermedia (multi-media) information, and defensive information warfare technologies. This project also develops the erasable optical data storage systems with high capacity and fast input/output speed for fighter aircraft operation (to provide fast airborne access to mission-oriented data and the digital terrain system), and electronic surveillance aircraft (for on-board sensor data recording, operational mission planning requirements, large data storage requirements (i.e., high-volume, soft-copy, digital imagery exploitation)). Algorithms will be provided to automate the selection, and retrieval, and downloading of information stored on mass storage devices which are distributed across the data network. An array of optical disk drives will be developed for high throughput speed and fault-tolerant requirements. Three-dimensional (3-D) optical memory systems will be developed for volumetric digital data storage. This new mass storage technology will demonstrate ultra-high data density and fast, parallel data access within a low-cost, compact system.</p>										
Project 2810			Page 3 of 11 Pages			Exhibit R-2 (PE 0603726F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration	PROJECT 2810
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li>– (U) \$3,000 Developed and demonstrated advanced imagery information sensor fusion and spatial database technologies to enhance warfighter mission planning, navigation, targeting, and terrain analysis. <li>– (U) Conducted Phase 2 demonstration of multiple database integration and update capability to maintain a single uniform and current vector database for real-time access; demonstrated automated update of multiple heterogeneous data bases simultaneously to support interdisciplinary correlation and new information sources. <li>– (U) Developed a portable electronic information correlator for deployment with tactical communications systems to automatically correlate signal intelligence multisensor inputs on the battlefield; conducted final demonstration at user's site of the enhanced, all-source, sensor fusion capability to locate, identify, and track mobile friend and foe (i.e., threats and targets) battlefield components. <li>– (U) \$247 Demonstrated and delivered automated capabilities to access, process, and display hypermedia (integrated text, imagery, audio, and video) information which fully exploit relationships between data available to the field commander in a timely manner. <ul style="list-style-type: none"> <li>– (U) Demonstrated and delivered hypermedia algorithms for use with operational databases and navigational aid capabilities. <li>– (U) Demonstrated and delivered advanced hypermedia techniques for video indexing overlaps and links to connect secure information data bases. <li>– (U) \$1,727 Developed and demonstrated optical information data handling, storage, and access technologies for strategic and tactical applications. <ul style="list-style-type: none"> <li>– (U) Fabricated pre-brassboard model of a three-dimensional (3-D) optical memory capable of storing 100 gigabytes of information and reconstructing it using a parallel optical readout technique; exploited virtual reality technology using digital data stored and accessed via 3-D optical memories. <li>– (U) \$1,194 Designed, developed, and demonstrated optical disk and interface technologies which can be implemented in joint theater operations. <ul style="list-style-type: none"> <li>– (U) Completed the fabrication and demonstration of high-capacity Optical Jukebox interface with an information network. <li>– (U) Enhanced algorithm development and demonstrated the capability to select, retrieve, and store digital data from different sources and transfer such data to field units. <li>– (U) \$6,168 Total 		
Project 2810	Page 4 of 11 Pages	Exhibit R-2 (PE 0603726F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration	PROJECT 2810
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li> – (U) \$3,190 Develop and demonstrate advanced imagery information and spatial data base technologies to enhance warfighter mission planning, navigation, targeting, and terrain analysis. <ul style="list-style-type: none"> <li>– (U) Complete Phase 2 demonstration of multiple database integration and update capability to maintain a single uniform and current vector database for real-time access; demonstrate automated update of multiple heterogeneous data bases simultaneously to support interdisciplinary correlation and new information sources. <li>– (U) Continue development of the portable electronic information correlator for deployment with tactical communications systems to automatically correlate signal intelligence multisensor inputs on the battlefield. <li> – (U) \$255 Develop and demonstrate automated capabilities to access, process, and display hypermedia (integrated text, imagery, audio, and video) information which fully exploit relationships between data available to the field commander in a timely manner. <ul style="list-style-type: none"> <li>– (U) Complete development of hypermedia algorithms for use with operational intelligence databases. <li>– (U) Develop advanced hypermedia techniques for collection, integration and dissemination of hypermedia for widespread use. <li>– (U) Develop information extraction technologies and capabilities to exploit data from unformatted text by automating the extraction and visualization process. <li> – (U) \$643 Develop and demonstrate optical information data handling, storage, and access technologies for strategic and tactical applications. <ul style="list-style-type: none"> <li>– (U) Deliver and demonstrate within an operational facility, a three-dimensional (3-D) optical memory using a write-once, read-many optical material. <li>– (U) Design a pre-brassboard model using a fully erasable 3-D optical material. <li>– (U) Design mass storage modules that integrate the benefits of 3-D optical memory with optical communication for instant access to multi-terabyte digital libraries. <li> – (U) \$505 Design, develop, and demonstrate optical disk and interface technologies which can be implemented in joint theater operations. <ul style="list-style-type: none"> <li>– (U) Deliver and evaluate search and retrieval algorithms for application to networked intelligence production facilities. <li>– (U) Develop a multi-layered optical disk technique for a ten-fold (10X) storage improvement. <li>– (U) Develop optical tape recording providing terabyte storage on a 12-inch reel for long-term, high-dense data retention applications. <li> – (U) \$4,593 Total 		
Project 2810	Page 5 of 11 Pages	Exhibit R-2 (PE 0603726F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration	PROJECT 2810
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$592 Develop and demonstrate advanced imagery information, sensor fusion, and spatial database technologies to enhance warfighter mission planning, navigation, targeting, and terrain analysis. <ul style="list-style-type: none"> – (U) Conduct Phase 3 demonstration of multiple database integration and update capability to maintain a single uniform and current vector database for real-time access. – (U) Design software algorithms which can be deployed with tactical communications systems to automatically correlate signal intelligence multisensor inputs on the battlefield. – (U) Design an adaptive sensor fusion module and process controller to automatically correlate information regardless of the environment or source of sensor data. – (U) \$1,729 Develop and demonstrate automated capabilities to access, process, and display intelligence and sensor data to improve the sensor exploitation process. <ul style="list-style-type: none"> – (U) Design the capability to locate and harvest intelligence data stored in existing and future databases. – (U) Design analytical software modules which provide decision options for warfighters located at geographically separated units. – (U) Design information extraction technologies and capabilities to exploit data from unformatted text by automating the extraction and information visualization (i.e., battlesphere situational awareness) process. – (U) \$2,507 Develop and demonstrate optical information data handling, storage, and access technologies for strategic and tactical applications. <ul style="list-style-type: none"> – (U) Complete system design for a fully erasable three-dimensional (3-D) optical memory. – (U) Complete design for an initial mass storage module providing a two-dimensional (2-D) optical filtering/correlation function. Provides a high-speed associative search capability. – (U) \$330 Design, develop, and demonstrate optical disk and interface technologies which can be implemented in joint theater operations. <ul style="list-style-type: none"> – (U) Demonstrate a multi-layered optical disk system using an erasable phase change material for higher storage capacity and lower manufacturing costs. – (U) Demonstrate an optical tape recorder/reader using a multi-laser beam design for a ten-fold (10X) improvement in data transfer speeds. – (U) \$691 Design, develop, and demonstrate mission planning and rehearsal capabilities for theater battle management. <ul style="list-style-type: none"> – (U) Design the capability to conduct semi-automated, objectives-based planning and assessment for Air Force and joint Command and Control (C2) requirements. – (U) \$5,849 Total 		
Project 2810	Page 6 of 11 Pages	Exhibit R-2 (PE 0603726F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration	PROJECT 2810
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	6,262	4,867	5,286	Cont
(U) Current Budget Submit/FY 1999 PB	6,168	4,593	5,849	Cont

(U) Change Summary Explanation:

Funding: Changes in this project since the previous President's Budget are due to increased emphasis on Advanced Image/Information/Optical Memory technology applications within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602702F, Command, Control, and Communications (C3).
- (U) PE 0603789F, C3 Advanced Development.
- (U) PE 0603728F, Advanced Computing Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration	PROJECT 2863
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2863 Integrated Photonics	1,999	4,771	5,176	5,661	0	0	0	0	TBD

(U) A. Mission Description and Budget Item Justification: Current electronic systems are susceptible to electromagnetic interference, electromagnetic pulse, and radio frequency (RF) interference. Size constraints, speed, and reliability also limit traditional electronic systems. Photonics-based systems, which process information in the form of light (photonic) signals, will provide major improvements in tactical and strategic Command, Control, and Communications (C3) systems by providing small-size, high-performance, high-capacity, survivable alternatives to electronic-based systems. This project develops and demonstrates advanced hardware technology in optical processing, adaptive transmission, and nonlinear optical processing.

(U) FY 1997 (\$ in Thousands):

- (U) \$162 Developed and demonstrated analog and digital optical processing technologies to provide real-time data for pre- and post-mission analysis, as well as sensor integration and automatic target identification using multispectral surveillance systems.
- (U) Began fabrication of a photonically interconnected Command, Control, and Communications (C3) processor for a technology demonstrator; demonstrated the advantages of photonic, high-speed agile processors in a variety of radar and communications functions.
- (U) Developed and tested laser resources for wide bandwidth optical processing and radio frequency (RF) systems.
- (U) \$794 Developed and demonstrated microwave/millimeter-wave photonics processing and subsystems for advanced optically-controlled RF systems at increased frequencies.
- (U) Conducted first stage development of 100 Gigahertz (GHz) RF photonic interconnect system extending the frequency and bandwidth of previous microwave link programs to support communications and surveillance.
- (U) Developed high frequency electro-optic modulators for use in high dynamic range, low noise RF systems.
- (U) \$1,043 Developed high performance control systems for RF phased array antennas providing extremely wide angle coverage, broadband, and anti-jam capabilities.
- (U) Began fabrication of a super high frequency (SHF) optically controlled phased array antenna.
- (U) Began design of an extremely high frequency (EHF) optically controlled phased array antenna with the agility needed for steering operational communications antennas.
- (U) \$1,999 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration	PROJECT 2863
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li>– (U) \$1,261 Develop and demonstrate analog and digital optical processing technologies to provide real-time data for pre- and post-mission analysis, as well as sensor integration and automatic target identification using multispectral surveillance systems. <li>– (U) Develop and transition laser sources, interconnect subsystems, and other key photonic components for wide bandwidth, high throughput, optical processing systems. <li>– (U) \$1,385 Develop and demonstrate microwave/millimeter-wave photonics processing and subsystems for advanced optically-controlled radio frequency (RF) systems at increased frequencies. <li>– (U) Demonstrate high frequency electro-optic modulators, sources, and other photonic components for use in wide bandwidth, high dynamic range, low noise RF systems. <li>– (U) \$2,125 Developed high performance control systems for RF phased array antennas providing extremely wide angle coverage, broadband, and anti-jam capabilities. <li>– (U) Complete fabrication and testing of a super high frequency (SHF) optically controlled phased array antenna. <li>– (U) Complete design of an extremely high frequency (EHF) optically controlled phased array antenna with the agility needed for steering operational communications antennas. <li>– (U) \$4,771 Total 		
Project 2863	Page 9 of 11 Pages	Exhibit R-2 (PE 0603726F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration	PROJECT 2863
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> <li> <p>–(U) \$1,421 Develop and demonstrate analog and digital optical processing technologies to provide real-time data for pre- and post-mission analysis, as well as sensor integration and automatic target identification using multispectral surveillance systems.</p> <ul style="list-style-type: none"> – (U) Develop optical micro-networks appropriate for use in high-speed processors for air and space platforms. – (U) Integrate, test, and transition laser sources, interconnect subsystems, and other key photonic components for wide bandwidth, high throughput, optical processing systems onto airborne high performance computers. <li> <p>– (U) \$1,500 Develop and demonstrate microwave/millimeter-wave photonics processing and subsystems for advanced optically-controlled radio frequency (RF) systems at increased frequencies.</p> <ul style="list-style-type: none"> – (U) Begin design of a dynamically reconfigurable radio frequency signal distribution system for use on air and space platforms. – (U) Test and integrate into airborne RF sensor and countermeasure systems high frequency electro-optic modulators, sources, and other photonic components. <li> <p>– (U) \$2,255 Develop high performance control systems for RF phased array antennas providing extremely wide angle coverage, broadband, and anti-jam capabilities.</p> <ul style="list-style-type: none"> – (U) Complete transition of a super high frequency (SHF) optically controlled phased array antenna onto airborne command and control platforms for satellite communications. – (U) Begin fabrication phase of an extremely high frequency (EHF) optically controlled phased array antenna with the agility needed for steering operational satellite communications antennas <li> <p>– (U) \$5,176 Total</p> 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603726F C3 Subsystem Integration	PROJECT 2863
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	2,128	5,055	5,280	Cont
(U) Current Budget Submit/FY 1999 PB	1,999	4,771	5,176	TBD

(U) Change Summary Explanation:

Funding: Changes in this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0602702F, Command, Control, and Communications (C3).
- (U) PE 0603789F, C3 Advanced Development.
- (U) PE 0603728F, Advanced Computing Technology.
- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computer Technology
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	7,558	5,270	7,827	8,050	8,082	8,321	8,535	Continuing	Continuing
2527 Software Life Cycle Tools	2,087	1,092	2,289	2,343	2,354	2,401	2,466	Continuing	Continuing
2530 Distributed Systems Reliability and Survivability	2,384	1,560	2,407	2,462	2,472	2,535	2,603	Continuing	Continuing
2532 Knowledge-Based Systems	3,087	2,618	3,131	3,245	3,256	3,385	3,466	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. **Mission Description and Budget Item Justification:** This Advanced Technology Development program develops and demonstrates technologies needed to control cost, reduce risk, and increase efficiency and effectiveness of software and computers required for Air Force mission critical combat systems. The Air Force has experienced a dramatic escalation in the cost of acquiring and maintaining embedded computer software for increasingly complex military systems which must be reliable and survivable in the battlefield environment. The requirement for survivable tactical and strategic computing systems has driven the need for automatic integration and interoperability of multiple processing elements, automatic redistribution of data and functions, and location-independent access to data. Distributed processing techniques, which can dynamically reconfigure Command, Control, Communications, and Computer (C4) systems to accommodate lost components or nodes, are required to ensure survivable mission critical command and control functions. Note: In FY 1999 and out, additional emphasis has been placed on advanced computer technologies to meet future user requirements.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computer Technology
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	8,089	5,613	6,684	Cont
(U) Appropriated Value	8,509	5,613		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-219	-214		
b. SBIR	-201	-129		
c. Omnibus/Other Above Threshold Reprogrammings	-518			
d. Below Threshold Reprogrammings				
e. Rescissions	-13			
(U) Other Adjustments to Budget Years Since FY 1998 PB			1,143	
(U) Current Budget Submit/FY 1999 PB	7,558	5,270	7,827	Cont

(U) **Change Summary Explanation:**

Funding: Changes to this PE since the previous President's Budget are due to increased emphasis on Advanced Computer technologies within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:** Not Applicable.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603728F Advanced Computer Technology				PROJECT 2527		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2527	Software Life Cycle Tools	2,087	1,092	2,289	2,343	2,354	2,401	2,466	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Advanced computer systems in Air Force weapon systems require software life cycle tools and technology to reduce costs, improve quality, and enhance productivity. This project develops, evaluates, and transitions new software technology that reduces cost, while improving software, systems, and productivity factors. It develops software life cycle support environments which incorporate both laboratory and commercial off-the-shelf (COTS) products. This project provides a vehicle for software technology integration, transition, and evaluation under operational and field conditions. Technologies for system requirements analysis, reuse of software components, software quality specification, measurement, assessment, and high performance (parallel) computer software engineering are also produced.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$655 Designed, developed, tested, and demonstrated technology for the capture and exploitation of information for building evolutionary systems, capabilities to model and analyze complex systems, dynamic programming languages, and formal methods for defining, analyzing, and assessing evolutionary systems. <ul style="list-style-type: none"> - (U) Completed final demonstrations of network-oriented software support environments which emphasize affordability and software reuse certification technologies and provided this capability to the user. - (U) Designed technologies for packaging diverse software capabilities such as visualization, hyper-programming, dynamic testing, and object-oriented languages. Combined with an integrated approach for dealing with system requirements and documentation. - (U) Designed open-systems technology for evolving software systems which are compatible with the commercial international network. - (U) \$620 Developed and demonstrated advanced software technologies to provide the user the means to analyze operational software requirements. <ul style="list-style-type: none"> - (U) Completed the development performance modeling aspect of the Block 1 advanced requirements analysis workstation. - (U) Based on industry comments, user feedback, and the need for addressing operational software requirements analysis, completed an assessment of the operational requirements analysis/workstation. - (U) \$292 Developed and demonstrated software quality enhancements through automated tools and methods. <ul style="list-style-type: none"> - (U) Completed case studies for software quality technology demonstration; provided third increment of repository software information. - (U) \$520 Developed high performance advanced parallel computer software and architecture for weapon and information systems applications. <ul style="list-style-type: none"> - (U) Developed and tested software upgrades to the Parallel Assessment Window System to provide a "user friendly" interface for adding new architectures and execution criteria. Efforts were focused on capabilities to define emerging parallel architectures and methods for comparing execution profiles. - (U) Completed development efforts on the architecture-independent parallel design tool and demonstrated it on advanced parallel computer systems. 										
Project 2527		Page 3 of 13 Pages				Exhibit R-2 (PE 0603728F)				

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computer Technology	PROJECT 2527
<ul style="list-style-type: none"> - (U) Completed design and development of methods for integrating and demonstrating component level software technology for parallel computing systems for "typical" Air Force Command, Control, Communications and Intelligence (C3I) problem domains. - (U) \$2,087 Total 		
(U) <u>FY 1998 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$561 - (U) \$273 	<ul style="list-style-type: none"> Design, develop, test, and demonstrate technology for the capture and exploitation of information for building evolutionary systems, capabilities to model and analyze complex systems, and formal methods for defining, analyzing, and assessing evolutionary systems. - (U) Develop and test technology for packaging diverse software capabilities such as visualization, hyper-programming, dynamic testing, and object-oriented languages. Combine with an integrated approach for dealing with system requirements and documentation and implement using the existing systems engineering framework. - (U) Develop and test open-systems technology for evolving software systems which are compatible with the commercial international network technology and which enhance life cycle costs of Air Force software intensive systems. Efforts will focus on component level capabilities for design rationale, capture, and architecture based framework implementation. 	
<ul style="list-style-type: none"> - (U) \$258 	<ul style="list-style-type: none"> Develop high performance advanced parallel computer software and architecture for weapon and information system applications. - (U) Complete the effort to optimize parallel software upgrades to the Parallel Assessment Window System. Demonstrate these capabilities on heterogeneous systems made up of commercial-off-the-shelf (COTS) technology and specialized weapon system hardware/software. - (U) Complete methods for integrating and demonstrating parallel computing systems software technology for "typical" Air Force C3I problem domains. 	
<ul style="list-style-type: none"> - (U) \$1,092 Total 	<ul style="list-style-type: none"> Design, develop, and demonstrate technology for the exploitation of easily changeable software (dynamic languages) that provides flexibility to speed up the design and change process. - (U) Design the capability to integrate program code of dynamic and static languages (not easily changed once compiled) within the same module, and to incrementally generate code. - (U) Design dynamic languages and software development support tools that are as efficient as static languages and meet military performance constraints. 	
(U) <u>FY 1999 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$1,147 	<ul style="list-style-type: none"> Design, develop, test, and demonstrate technology for the capture and exploitation of information for building evolutionary systems, capabilities to model and analyze complex systems, and formal methods for defining, analyzing, and assessing evolutionary systems. - (U) Demonstrate technology for packaging diverse software capabilities such as visualization, hyper-programming, dynamic testing, and object-oriented languages. Combine with an integrated approach for dealing with system requirements and documentation and implement using the existing systems engineering framework. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
3 - Advanced Technology Development	0603728F Advanced Computer Technology	2527
<ul style="list-style-type: none"> – (U) \$872 (U) Demonstrate open-systems technology for evolving software systems which are compatible with the commercial international network technology and which enhance life cycle costs of Air Force software intensive systems. Efforts will focus on component level capabilities for design rationale, capture, and architecture based framework implementation. – (U) \$872 Design, develop, and demonstrate technology to mathematically represent, analyze, and assess complex software systems and their architectures to enhance software quality and validity. – (U) (U) Develop and test the ability to mathematically represent architectural, functional, and Quality of Service (safety, performance, reliability, security, fault tolerance, etc.) properties to enable automatic design analysis and performance evaluation of software systems. – (U) (U) Design analytical methods for monitoring system Quality of Service parameters; design requirement assumptions; and testing quality of software systems. – (U) \$270 Design, develop, and demonstrate technology for the exploitation of easily changeable software (dynamic languages) that provides flexibility to speed up the design and change process. – (U) (U) Develop and test the capability to integrate program code of dynamic and static languages (not easily changed once compiled) within the same module, and to incrementally generate code. – (U) (U) Develop and test dynamic languages and software development support tools that are as efficient as static languages and meet military performance constraints. – (U) \$2,289 Total 		
Project 2527	Page 5 of 13 Pages	Exhibit R-2 (PE 0603728F)

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computer Technology	PROJECT 2527
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	2,438	1,167	1,687	Cont
(U) Current Budget Submit/FY 1999 PB	2,087	1,092	2,289	Cont

(U) Change Summary Explanation:

Funding: Changes to this PE since the previous President's Budget are due to increased emphasis on Advanced Computer technologies within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary:

(U) Related Activities:

- (U) PE 0604740F, Computer Resource Management.
- (U) PE 0701112F, Inventory Control Point Operation.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computer Technology	PROJECT 2530
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2530 Distributed Systems Reliability and Survivability	2,384	1,560	2,407	2,462	2,472	2,535	2,603	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project develops software technology to provide the distributed computer information handling for future Command, Control, Communications, and Computer (C4) systems. These technologies integrate numerous heterogeneous processing networks and provide secure, seamless access to information. Future C4 systems must be reconfigurable, operate in real-time, and be survivable, as well as capable of integrating the full spectrum of multimedia data. These systems will operate in an "information pull" mode where the users' requests for information are filled without explicit action on the part of the user to locate, retrieve, or merge data. An object-oriented architecture provides a common perspective which integrates the communications control system and the distributed computing environment.

- (U) FY 1997 (\$ in Thousands):**
- (U) \$856 Developed and demonstrated heterogeneous, secure, multi-networked distributed computing environments for interoperability and survivability.
 - (U) Developed the integration of security mechanisms into multi-networked distributed computing environments.
 - (U) Developed the ability to establish a distributed computing environment across a limited bandwidth interconnection.
 - (U) Integrated mobile computing nodes into a heterogeneous distributed computing environment.
 - (U) \$757 Developed and demonstrated distributed database management techniques for managing multimedia data in distributed information systems.
 - (U) Developed artificial intelligent agents for retrieval of multimedia data across a wide area network.
 - (U) Integrated speech as a managed object in an object-based, distributed, multimedia database management system.
 - (U) Developed multimedia database management across multiple locally netted computers.
 - (U) \$771 Developed real-time adaptive distributed computing environments to support crisis management and survivability.
 - (U) Developed an adaptive reconfigurable distributed computing environment based upon an application-derived parameter.
 - (U) Developed real-time distributed computing architecture across heterogeneous networks for tracking.
 - (U) Developed dynamic process and data migration across a multi-networked distributed information system.
 - (U) \$2,384 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computer Technology	PROJECT 2530
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<p>– (U) \$780</p>	<p>Develop and demonstrate heterogeneous, secure, multi-networked distributed computing environments for interoperability and survivability.</p>	
	<p>– (U) Demonstrate utility of security mechanisms integrated into multi-networked distributed computing environments.</p>	
	<p>– (U) Test the design of a distributed computing environment across a limited bandwidth connection.</p>	
	<p>– (U) Test the design of mobile computing nodes in a heterogeneous distributed computing environment.</p>	
<p>– (U) \$327</p>	<p>Develop and demonstrate distributed database management techniques for managing multimedia data in distributed information systems.</p>	
	<p>– (U) Test the artificial intelligent design for retrieval of multimedia data across a wide area network.</p>	
	<p>– (U) Integrate video as a managed object in an object-based, distributed, multimedia database management system.</p>	
	<p>– (U) Test the design of multimedia database management across multiple locally netted computers.</p>	
<p>– (U) \$453</p>	<p>Develop real-time adaptive distributed computing environments to support crisis management and survivability.</p>	
	<p>– (U) Test the adaptive reconfigurable distributed computing environment design based upon an application-derived parameter.</p>	
	<p>– (U) Test the design of a real-time distributed computing architecture across heterogeneous networks for tracking.</p>	
	<p>– (U) Demonstrate dynamic process and data migration across a multi-networked distributed information system.</p>	
<p>– (U) \$1,560</p>	<p>Total</p>	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p>		
<p>– (U) \$1,235</p>	<p>Develop and demonstrate heterogeneous, secure, multi-networked distributed computing environments for interoperability and survivability.</p>	
	<p>– (U) Integrate information warfare technologies into multi-networked distributed computing environments.</p>	
	<p>– (U) Demonstrate the ability of a distributed computing environment to adapt to a limited bandwidth (low-speed) interconnection.</p>	
	<p>– (U) Demonstrate the ability to dynamically and autonomously reconfigure the distributed network for mobile computing nodes in a heterogeneous distributed computing environment.</p>	
	<p>– (U) Demonstrate reliability, availability, performance, and resource management across distributed sets of nodes.</p>	
<p>– (U) \$532</p>	<p>Develop and demonstrate distributed database management techniques for managing multimedia data in distributed information systems.</p>	
	<p>– (U) Demonstrate the utility of artificial intelligent agents for the retrieval of multimedia data across a wide area network.</p>	
	<p>– (U) Demonstrate the integration of audio/video/data as a managed object in an object-based, distributed, multimedia database management system.</p>	
	<p>– (U) Demonstrate multimedia database management across multiple wide-area networked computers.</p>	
<p>– (U) \$640</p>	<p>Develop real-time adaptive distributed computing environments that support crisis management and survivability.</p>	
	<p>– (U) Demonstrate a reconfigurable distributed computing environment based upon external parameters (i.e., network configuration, user/mission needs, operational environment) as well as multiple application-derived parameters.</p>	
	<p>– (U) Demonstrate real-time distributed computing architecture across heterogeneous networks.</p>	
<p>Project 2530</p>	<p align="center">Page 8 of 13 Pages</p>	<p align="right">Exhibit R-2 (PE 0603728F)</p>

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603728F Advanced Computer Technology				PROJECT 2532		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2532 Knowledge-Based Systems	3,087	2,618	3,131	3,245	3,256	3,385	3,466	Continuing	Continuing	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Knowledge-based computer systems provide the capability to automatically solve reasoning problems. This effort develops computer technologies which automate the problem solving process associated with human thought. It has three major thrusts. The first, knowledge-based analysis, provides software tools and techniques to develop and evaluate knowledge-based intelligent information tools to support robust, real-time, large-scale information systems. The second, knowledge-based planning, applies artificial intelligence (AI) technology to provide increased cost-effectiveness in diverse planning applications such as air operations planning and execution management, employment and deployment planning, logistics planning, resource allocation, and scheduling processes. The third, knowledge-based software techniques, exploits knowledge-based methods to achieve major improvements in software development and support activities.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$210 Developed and demonstrated knowledge-based software analysis technologies to support robust, real-time, large-scale information systems. <ul style="list-style-type: none"> - (U) Developed high level tools and methodology facilitating the evolution, evaluation, and integration of information sources for collaborative intelligent information systems capable of coordination, cooperation, and negotiation. - (U) \$1,507 Developed and demonstrated knowledge-based technologies to automate labor-intensive tasks to allow rapid, accurate, and efficient planning. <ul style="list-style-type: none"> - (U) Completed development schedule planning tools to provide for real-time operational use for strategic airlift. - (U) Developed artificial intelligence planning and scheduling tools for imprecise environments. - (U) Demonstrated generative planning and intelligent automated assistance for both planning and monitoring of joint air campaign. - (U) Demonstrated strategies for efficient planning scenario generation in various military domains. - (U) \$1,370 Developed and demonstrated knowledge-based technologies that support the evolution and adaptation of software systems. <ul style="list-style-type: none"> - (U) Completed Knowledge-Based Software Assistant (KBSA) advanced development model, supporting process representation, configuration management, text generation, instrumentation, and project management. Evaluated in a mission critical application. - (U) Developed knowledge-based evolutionary design tools for software and system development. - (U) \$3,087 Total 										
Project 2532			Page 10 of 13 Pages				Exhibit R-2 (PE 0603728F)			

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computer Technology	PROJECT 2532
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(U) FY 1998 (\$ in Thousands):

- (U) \$241 Develop and demonstrate knowledge-based technologies to support active robust, real-time, large-scale intelligent information systems.
 - (U) Test systematic tools and evaluation methodology for collaborative intelligent information systems capable of coordination, cooperation, and negotiation.
 - (U) Develop knowledge-based acquisition tools to guide users in augmenting systems and deriving knowledge for large quantities of distributed data for active information systems.
- (U) \$1,916 Develop and demonstrate knowledge-based technologies in continuous planning to allow rapid, accurate, and efficient plan generation.
 - (U) Develop the test plan and feasibility estimation for both planning and monitoring of joint air campaigns.
 - (U) Test artificial intelligence planning and scheduling tools for imprecise environments.
 - (U) Integrate generative planning and intelligent automated assistance for both planning and monitoring of joint air campaign.
 - (U) Test strategies for efficient planning scenario generation in various military domains.
 - (U) Develop knowledge-based technologies in continuous planning to allow rapid, accurate, and efficient plan generation.
- (U) \$461 Develop and demonstrate knowledge-based technologies that support the evolution and adaptation of software systems.
 - (U) Test knowledge-based evolutionary design tools for software and system development in military applications.
 - (U) Develop knowledge-based acquisition capabilities that assist in monitoring and evaluating the satisfaction and capture of requirements and rationale for software systems.
- (U) \$2,618 Total

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603728F Advanced Computer Technology	PROJECT 2532
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$490 Develop and demonstrate knowledge-based technologies to support active, robust, real-time warfighting applications for large-scale intelligent information systems. <ul style="list-style-type: none"> – (U) Integrate systematic tools and evaluation methodology for collaborative intelligent information systems capable of coordination, cooperation, and negotiation. – (U) Test tools for the acquisition of knowledge bases that support active information systems. These tools will guide users in augmenting systems and deriving knowledge for large quantities of distributed data. – (U) Develop collaborative decision-based and knowledge-based agents for large-scale information systems. – (U) Develop information system techniques to support real-time large-scale dynamic data mining – (U) \$1,834 Develop and demonstrate knowledge-based technologies for planning in large imprecise environments. <ul style="list-style-type: none"> – (U) Demonstrate feasibility estimation techniques for both planning and monitoring of joint air campaigns. – (U) Demonstrate artificial intelligence planning and scheduling tools for imprecise environments. – (U) Complete flexible planning and automated domain-expert assistance for both planning and monitoring the joint air campaign. – (U) Demonstrate strategies for efficient planning scenario generation in various military domains. – (U) Test knowledge-based technologies in continuous planning to allow rapid, accurate, and efficient plan generation. – (U) Develop planning and information-based agents for adaptive re-planning for large-scale military systems – (U) Develop tools for man/machine collaborative advisable planning and visual demonstration including distributed planning cells. – (U) Develop Artificial Intelligence/Operations Research (AI/OR) conceptual modeling tools for planning information-based systems. – (U) \$807 Develop and demonstrate knowledge-based technologies that support the evolution and adaptation of software systems. <ul style="list-style-type: none"> – (U) Demonstrate knowledge-based evolutionary design tools for software and system development in military applications. – (U) Test knowledge-based acquisition capabilities that assist monitoring and evaluating the quality of requirements generation, as well as capturing these requirements and rationale during software development. – (U) \$3,131 Total 		
Project 2532	Page 12 of 13 Pages	Exhibit R-2 (PE 0603728F)

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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	11,283	12,865	13,235	13,645	15,651	15,527	15,884	Continuing	Continuing
2335 Advanced C3 Technology	4,120	5,069	4,038	4,167	5,263	5,191	5,312	Continuing	Continuing
4072 Correlation and Fusion	4,983	6,453	6,804	6,975	7,697	7,594	7,759	Continuing	Continuing
4216 Warfighter Information Usage, Management, and Integration Technologies	2,180	1,343	2,393	2,503	2,691	2,742	2,813	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Beginning in FY 1998, PE 0603238F, Global Surveillance and Communications, has been incorporated as Project 4216, Warfighter Information Usage, Management, and Integration Technologies, within this PE. The total PE cost shown for FY 1997 reflects this consolidation.

(U) A. Mission Description and Budget Item Justification: This Advanced Technology Development program develops and demonstrates ground and aerospace Command, Control, and Communications (C3) technology required to maintain Air Force capabilities in a fast-paced, sophisticated, high threat, and intense jamming environment. Enhanced surveillance and communications technology must be developed to counteract an enemy's jamming and to restore critical communications links to the warfighter. The technologies developed in this program include detection, identification, and tracking of hostile targets at long ranges on Command and Control (C2) and Intelligence platforms under combat conditions. Additionally, this project develops reliable, secure, jam-resistant communications, and battle management technology that supports the military leader's combat decisions in response to the changing dynamics of the battlefield. Note: In FY 1999 and out, additional emphasis has been placed on C3 technologies and correlation and fusing technologies to meet future user requirements.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	12,580	12,897	13,501	Cont
(U) Appropriated Value	13,188	13,647		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-319	-483		
b. SBIR	-289	-299		
c. Omnibus/Other Above Threshold Reprogrammings	-1,138			
d. Below Threshold Reprogrammings	-138			
e. Rescissions	-21			
(U) Other Adjustments to Budget Years Since FY 1998 PB			-266	
(U) Current Budget Submit/FY 1999 PB	11,283	12,865	13,235	Cont

(U) Change Summary Explanation:

Funding: Changes to this PE since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary: Not Applicable.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 3 - Advanced Technology Development				PE NUMBER AND TITLE 0603789F C3 Advanced Development				PROJECT 2335	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2335 Advanced C3 Technology	4,120	5,069	4,038	4,167	5,263	5,191	5,312	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project develops Command, Control, and Communications (C3) technology for contingency and joint operations focusing on the concepts of force deployment, sustainment, and employment. Dynamic, hostile battlefield environments demand near instantaneous transmission and processing of vast amounts of C3 information for real-time decision making. This project develops and integrates technologies for: low probability of intercept/anti-jam transmission; modular, programmable, multi-level secure communications; secure survivable networks; advanced displays and interfaces; and battle management decision support capabilities for survivable, distributed Command and Control (C2) facilities. Multiband/multimode programmable radios will be enhanced to address the transmission link requirements of joint combat theater communications. Note: During FY 1997, the Defensive Planning and Execution (DPE) program was renamed the Joint Defensive Planner (JDP) per the Joint Standards Air Operations Software Configuration Control Board. The board designated DPE as the joint-Services software application for theater air and missile defensive planning and monitoring.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,267 Developed and demonstrated critical ground and aerospace communications technology advances in programmable devices and monolithic microwave integrated circuits to provide survivable radios and transceivers. - (U) Demonstrated SPEAKeasy (Phase-2) Model-1 equipment in support of the 11th Air Support Operations Squadron (ASOS) Tactical Air Control Party (TACP) during Task Force XXI Air Warfighter Experiment at Ft. Irwin, CA. - (U) Demonstrated SPEAKeasy on high frequency (HF), very high frequency (VHF), and ultra high frequency (UHF) communication bands operating in Single-Side-Band, amplitude modulated (AM), frequency modulated (FM), Single Channel Ground and Airborne Radio System (SINCGARS) and Have Quick (hopping and nonhopping) modes. - (U) Demonstrated open modular hardware, software reprogrammability, and voice-bridging of dissimilar radios. - (U) \$760 Demonstrated advanced networking technologies to provide efficient, secure, interoperable, and deployable communications systems. - (U) Based on revised specification, developed, integrated, and field-tested management system survivability and security features for survivable Asynchronous Transfer Mode (ATM) in an existing standards-based management platform system. - (U) Established under the survivable ATM effort, baseline network management system requirements for military quality-of-service, survivability, and performance measures. - (U) Developed for survivable ATM, a standard network management system interface allowing seamless interoperation with other standards-based military and commercial systems. 									
Project 2335			Page 3 of 14 Pages			Exhibit R-2 (PE 0603789F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 2335
<ul style="list-style-type: none"> - (U) \$1,093 Demonstrated theater battle management and time-critical air operations technologies to provide field commanders essential operational decision support and rapid response capabilities. <ul style="list-style-type: none"> - (U) Demonstrated the completed operations and surveillance integration brassboard designs; completed preliminary/final acceptance test in an operational environment; and hosted the operations and surveillance integration brassboard technology demonstration to the user. - (U) Completed final acceptance tests on an integrated information management capability for the Air Operations Center. Conducted the Operations/Intelligence Integration brassboard technology demonstration to the user. - (U) Developed user coordinated concept plan for developing an air Joint Defensive Planner (JDP) brassboard which integrates the use of air and ground surveillance and weapon systems assets; designed algorithms and paradigms to support an automated functional process. - (U) \$4,120 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,104 Develop and demonstrate critical ground and aerospace communications technology advances in programmable devices and monolithic microwave integrated circuits to provide survivable radios and transceivers. <ul style="list-style-type: none"> - (U) Demonstrate benefits and capabilities of Phase 2 SPEAKeasy system employing an advanced radio-frequency (with co-site mitigation) and smart radio functions in field tests. - (U) \$2,353 Demonstrate advanced networking technologies to provide efficient, secure, interoperable, and deployable communications systems. <ul style="list-style-type: none"> - (U) Develop an integrated (theater level) self-healing network capability. - (U) Demonstrate integrated protocols and network management capability for survivable Asynchronous Transfer Mode (ATM) on standards-based platforms. - (U) Enhance and expand the deployability of the survivable ATM demonstration system. - (U) \$612 Demonstrate theater battle management and time-critical air operations technologies to provide field commanders essential operational decision support and rapid response capabilities. <ul style="list-style-type: none"> - (U) Implement a limited brassboard capability for JDP. Employ the baseline capability to test and demonstrate knowledge-based decision support and artificial intelligence tools to facilitate automated JDP capabilities. - (U) \$5,069 Total 		
Project 2335	Page 4 of 14 Pages	Exhibit R-2 (PE 0603789F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 2335
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,802 Develop and demonstrate programmable devices and monolithic microwave integrated circuit technology in survivable radios and transceivers for critical ground and aerospace communications. <ul style="list-style-type: none"> - (U) Determine wideband performance limitations for SPEAKeasy terminal (bus and processor stressing conditions). - (U) Initiate an Advanced Technology Demonstration (ATD) for a smart networked radio. - (U) \$1,481 Demonstrate advanced networking technologies to provide efficient, secure, interoperable, and deployable communications systems. <ul style="list-style-type: none"> - (U) Demonstrate dynamic integrated self-healing networking, incorporating mobile ground/air communications elements, tactical ground elements, and satellite capability. - (U) \$755 Demonstrate theater battle management and time-critical air operations technologies to provide field commanders essential operational decision support and rapid response capabilities. <ul style="list-style-type: none"> - (U) Complete implementation of the limited brassboard capability and host the Joint Defensive Planner (JDP) advanced technology demonstration to the user. - (U) \$4,038 Total 		
Project 2335	Page 5 of 14 Pages	Exhibit R-2 (PE 0603789F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998															
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 2335															
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">4,265</td> <td style="text-align: center;">4,636</td> <td style="text-align: center;">4,119</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">4,120</td> <td style="text-align: center;">5,069</td> <td style="text-align: center;">4,038</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary:</u></p> <p>(U) <u>Related Activities:</u></p> <ul style="list-style-type: none"> - (U) PE 0603617F, C3 Applications. - (U) PE 0603737D, Advanced Research Projects Agency. - (U) PE 0603006A, C3 Technology. - (U) PE 0602702F, Command, Control, and Communications (C3). - (U) PE 0602232N, C3 Technology. - (U) PE 0603726F, C3 Subsystem Integration. - (U) PE 0603728F, Advanced Computing Technology. - (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication. <p>(U) D. <u>Schedule Profile:</u> Not Applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	4,265	4,636	4,119	Cont	(U) Current Budget Submit/FY 1999 PB	4,120	5,069	4,038	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>													
(U) Previous President's Budget (FY 1998 PB)	4,265	4,636	4,119	Cont													
(U) Current Budget Submit/FY 1999 PB	4,120	5,069	4,038	Cont													
Project 2335	Page 6 of 14 Pages	Exhibit R-2 (PE 0603789F)															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 4072
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4072 Correlation and Fusion	4,983	6,453	6,804	6,975	7,697	7,594	7,759	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: In order to ensure maximum target engagement ranges and a first-shot, first-kill capability, the Air Force must be able to detect, positively identify, and track hostile targets. This project develops and demonstrates sensor processing techniques, track and fusion algorithms, bistatic sensor technologies, and correlation techniques in order to enhance target detection and tracking ranges. This project develops and integrates the necessary suite of complementary passive and active hostile target identification technologies for command and control platforms. These technologies will enhance the performance of identification and threat assessment systems for improved acquisition, tracking, and target engagement ranges for theater operations.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 4072
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p>		
<p>– (U) \$2,313</p>	<p>Developed and demonstrated advanced sensor technologies and concepts for assured detection and tracking of hostile airborne targets using multiple off-board sensors.</p>	
	<p>– (U) Completed installation of multi-sensor integration algorithm on an operational surveillance platform and demonstrated on-board and off-board platform sensor fusion and integration.</p>	
	<p>– (U) Completed bench testing of active radar identification technologies on-board an operational surveillance platform for a FY 1999 demonstration and test.</p>	
	<p>– (U) Developed preliminary acoustic analysis algorithms to passively identify hostile targets for FY 2000 demonstration.</p>	
<p>– (U) \$742</p>	<p>Developed and demonstrated advanced passive sensor technologies and concepts for increased survivability of fielded systems and assured detection and tracking of combat threats.</p>	
	<p>– (U) Completed ground-based evaluations of the 64-channel bistatic ground testbed capability and identified areas which require further development to reduce technical risks of future airborne bistatic technology demonstrations.</p>	
	<p>– (U) Completed the design of an airborne bistatic testbed.</p>	
<p>– (U) \$1,928</p>	<p>Developed and demonstrated advanced sensor technologies and concepts for assured detection and tracking of hostile ground targets using multiple off-board sensors.</p>	
	<p>– (U) Completed evaluations of high performance computer parallel processing technology applications which employ real-time cueing and correlation techniques to enhance wide area surveillance, time-critical-target detection and tracking.</p>	
	<p>– (U) Conducted initial field demonstration tests of a real-time signal processor enhancement which performs sensory management and enhanced/inverse synthetic aperture radar algorithm functions on an operational systems testbed.</p>	
<p>– (U) \$4,983</p>	<p>Total</p>	
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<p>– (U) \$2,816</p>	<p>Develop and demonstrate advanced sensor technologies and concepts for assured detection and tracking of hostile airborne targets using multiple off-board sensors.</p>	
	<p>– (U) Develop and assess first generation intelligent techniques that exploit the inherent heuristic knowledge of an operator’s cognitive process to pro-actively assimilate dynamic track and intelligence data with a-priori static databases.</p>	
	<p>– (U) Integrate active radar identification technology on-board an operational surveillance platform.</p>	
	<p>– (U) Develop and assess second generation acoustic analysis algorithms to passively identify hostile targets.</p>	
<p>– (U) \$940</p>	<p>Develop and demonstrate advanced passive sensor technologies and concepts for increased survivability of fielded systems and assured detection and tracking of combat threats.</p>	
	<p>– (U) Integrate and test bistatic airborne testbed.</p>	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 4072
<ul style="list-style-type: none"> - (U) \$2,697 - (U) \$6,453 	<ul style="list-style-type: none"> Develop and demonstrate advanced sensor technologies and concepts for assured detection and tracking of hostile ground targets using multiple off-board sensors. - (U) Develop a preliminary real-time airborne design concept which demonstrates the use of all source advanced correlation capability for the detection and tracking of time-critical-targets. - (U) Complete test and demonstration of real-time signal processor enhancement hardware running algorithms on operational systems testbed. Total 	
(U) <u>FY 1999 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$2,998 - (U) \$964 - (U) \$2,842 - (U) \$6,804 	<ul style="list-style-type: none"> Develop and demonstrate advanced sensor technologies and concepts for assured detection, tracking, and identification of hostile airborne targets using multiple off-board sensors. - (U) Develop and assess second generation intelligent techniques that assist operators in identifying tracks and targets. - (U) Complete integration of active radar identification technology on-board an operational surveillance platform. - (U) Develop and evaluate third generation acoustic analysis algorithms for passively identifying hostile targets via an intelligence collection platform. Develop and demonstrate advanced passive sensor technologies and concepts that increase the survivability of fielded systems by quietly detecting and tracking combat threats. - (U) Complete bistatic airborne testbed integration and test. Develop and demonstrate advanced sensor technologies and concepts for assured detection, tracking, and identification of hostile ground targets using multiple off-board sensors. - (U) Continue design of real-time airborne demonstration of all source advanced correlation capability for the detection and tracking of time-critical targets. - (U) Develop teraflop signal processor technology for existing and future operational surveillance platform applications. Total 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 4072
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(U) **B. Program Change Summary (\$ in Thousands):**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	6,124	6,841	6,941	Cont
(U) Current Budget Submit/FY 1999 PB	4,983	6,453	6,804	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary:**

(U) Related Activities:

- (U) PE 0603203F, Advanced Avionics for Aerospace Vehicles.
- (U) PE 0602702F, Command, Control, and Communications (C3).
- (U) PE 0603742F, Combat Identification Technology.
- (U) PE 0603726F, C3 Subsystem Integration.
- (U) PE 0603728F, Advanced Computing Technology.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) **D. Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 4216
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4216 Warfighter Information Usage, Management, and Integration Technologies	2,180	1,343	2,393	2,503	2,691	2,742	2,813	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification: This project will develop and demonstrate the advanced technologies required to implement an interoperable, worldwide Information For The Warrior (IFTW) construct capable of supporting near-real-time multimedia (i.e., voice, data, video, and imagery) information exchange between ground and airborne platforms. The IFTW technology will provide “reachback” (i.e., updating information and mission changes to enroute aircraft and “in-transit visibility” of the aircraft and cargo status at Command and Control centers) to controlling headquarters. The IFTW capabilities will be enhanced through the incremental development, demonstration, and integration of advanced information management, airborne and ground communications, network and bandwidth management, communications protocols, and communications transmission systems technologies. It will address interoperation across echelon, Service, and multi-national force boundaries, as well as provide support for mobile command and control, and sensor-to-shooter operations. This program directly responds to user deficiencies as expressed by the Joint Staff (Command, Control, Communications, Computers, and Intelligence for the Warrior), the Air Force (Theater Deployable Communications), Air Mobility Command (Air Mobility Master Plan and Airborne Situational Awareness), and the Defense Information Systems Agency (Far-Term Defense Information Systems Network).

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 4216
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$898 Designed, developed, demonstrated, and integrated advanced information management technologies. <ul style="list-style-type: none"> - (U) Demonstrated integrated access to multiple operational command data bases and information structures. - (U) Demonstrated intelligent retrieval of information from operational command data structures. - (U) Developed and integrated capabilities for presentation of a coherent picture of the retrieved data to the user. - (U) \$500 Designed, developed, demonstrated, and integrated advanced airborne and super-high frequency communications technologies. <ul style="list-style-type: none"> - (U) Performed a low data rate global communications ground test. - (U) Completed the enhanced ultra high frequency and super-high frequency in-flight demonstration of commercial technologies. - (U) Performed an improved data processing assessment using the selected global broadcast service equipment suite. - (U) \$782 Designed, developed, demonstrated, and integrated advanced network and bandwidth management and communications protocol technologies. <ul style="list-style-type: none"> - (U) Demonstrated a distributed network management system with asynchronous transfer mode functionality. - (U) Developed proxy agents and demonstrated interoperability. - (U) Developed and demonstrated mission-based management. - (U) Developed and demonstrated a mobility management module. - (U) Completed a protocols laboratory demonstration. - (U) \$2,180 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$643 Design, develop, demonstrate, and integrate advanced information management technologies. <ul style="list-style-type: none"> - (U) Demonstrate an integrated capability for data retrieval, transfer, and presentation to the user. - (U) Integrate Information For The Warrior (IFTW) demonstration with information management technologies. - (U) \$383 Design, develop, demonstrate, and integrate advanced airborne and super-high frequency communications technologies. <ul style="list-style-type: none"> - (U) Develop and demonstrate the improved higher data rate data processing demonstration -- global broadcast service integration brassboard. - (U) Complete the improved higher data rate data processing demonstration -- global broadcast service in-flight demonstration. - (U) Integrate advanced communications technologies into the IFTW Advanced Technology Demonstration. - (U) \$317 Design, develop, demonstrate, and integrate advanced network and bandwidth management and communications protocol technologies. <ul style="list-style-type: none"> - (U) Develop and demonstrate the network planning module. - (U) Integrate network and bandwidth management technologies into the IFTW Advanced Technology Demonstration. 		
Project 4216	Page 12 of 14 Pages	Exhibit R-2 (PE 0603789F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	
		PROJECT 4216
<ul style="list-style-type: none"> - (U) \$1,343 	<ul style="list-style-type: none"> - (U) Conduct initial integration studies of incorporating new asynchronous transfer mode technology and emerging wireless asynchronous transfer mode techniques into the Information For The Warrior (IFTW) operational command environment. Total 	
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p>		
<ul style="list-style-type: none"> - (U) \$ 740 	<ul style="list-style-type: none"> - Design, develop, demonstrate, and integrate advanced information management technologies. 	
	<ul style="list-style-type: none"> - (U) Assess preliminary concept for development and integration of mediation (i.e., process of selecting the best communication routes) technologies and techniques. - (U) Conduct initial evaluation of IFTW information management technologies in joint task force and international interoperability environments. 	
<ul style="list-style-type: none"> - (U) \$ 825 	<ul style="list-style-type: none"> - Design, develop, demonstrate, and integrate advanced airborne and super-high frequency communications technologies. 	
	<ul style="list-style-type: none"> - (U) Conduct ground demonstration of "low-cost" solution for airframe Ku/Ka band electronically steered phased array antenna. - (U) Conduct preliminary investigation of future super-high frequency communications systems ability to provide additional in-transit visibility and reachback capabilities. 	
<ul style="list-style-type: none"> - (U) \$ 828 	<ul style="list-style-type: none"> - Design, develop, demonstrate, and integrate advanced network and bandwidth management and communications protocol technologies. 	
	<ul style="list-style-type: none"> - (U) Demonstrate advanced asynchronous transfer mode technology in an IFTW operational environment. - (U) Conduct preliminary development of smart agents for transparently routing communications throughout the network. - (U) Conduct preliminary application assessment of IFTW network and bandwidth management and protocol technologies in joint task force and international interoperability environments. 	
<ul style="list-style-type: none"> - (U) \$2,393 	<ul style="list-style-type: none"> Total 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 3 - Advanced Technology Development	PE NUMBER AND TITLE 0603789F C3 Advanced Development	PROJECT 4216
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	2,191	1,420	2,441	Cont
(U) Current Budget Submit/FY 1999 PB	2,180	1,343	2,393	Cont

(U) Change Summary Explanation:

Funding: Changes to this project since the previous President's Budget are due to higher priorities within the Science and Technology (S&T) Program and reflect the consolidation of PE 0603238F into this PE as Project 4216.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary: Not Applicable.

(U) Related Activities:

- (U) PE 0602702F, Command, Control, and Communications (C3).
- (U) PE 0603726F, C3 Subsystem Integration.
- (U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Schedule Profile: Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0208019F Tactical Information Program	PROJECT 4778
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4778 Integrated Broadcast Service	0	0	10,685	12,787	14,874	4,742	3,084	TBD	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	TBD	TBD

(U) The IBS program element (PE0603858F) was established after the FY 1999 President’s Budget database locked. FY 1999 and out funds will be transferred to the new PE.

(U) **A. Mission Description and Budget Item Justification**

IBS will consolidate existing intelligence broadcast systems into a single interoperable, common-format, common-terminal, theater-tailored intelligence and information dissemination architecture. IBS will design, prototype, and field a new dissemination architecture, incorporating new functionality in broadcast and information management, a new message format, and a new receiver. This program is in budget activity 4 because it includes demonstrating and validating the use of technologies to create an operational integrated broadcast service.

(U) **Acquisition Strategy**

IBS will use a spiral development program to create a common dissemination architecture. Systems and technology will be contracted for under a competitive Request for Proposal (RFP) process.

(U) **FY 1999 (\$ in Thousands):**

- (U) \$ 374 Program Management
- (U) \$1,496 System Engineering
- (U) \$2,876 Information Management Element
- (U) \$1,396 Tactical Information Element/Enhanced Tactical Information Element
- (U) \$2,707 Producer Information Element/Query
- (U) \$ 115 Test
- (U) \$1,721 Rapid Prototyping
- (U) \$10,685 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0208019F Tactical Information Program			PROJECT 4778			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>				
		0	0	0		<u>Cost</u>				
(U) Previous President's Budget (FY 1998 PB)		0	0	0						
(U) Appropriated Value		0	0	0						
(U) Adjustments to Appropriated Value										
a. Cong Reductions										
b. SBIR										
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming										
(U) Adjustments to Budget Years Since FY 1998 PB				+10,685		TBD				
(U) Current Budget Submit/ FY 1999 President's Budget				+10,685		TBD				
 (U) Change Summary Explanation:										
	FY 1999 new start.									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
			2,000						<u>Compl</u>	<u>Cost</u>
(U) Procurement/BA01/PE0208019F			2,000							
(U) O&M/BA01/PE0208019F			4,000							
 (U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
		1	2	3	4	1	2	3	4	
(U) Master Acquisition Plan					X					
 (U) Note: The IBS Program Management Office will publish an acquisition master plan, including schedule, by 1 Mar 98 per the DoD IPDM direction.										
Project 4778			Page 2 of 4 Pages				Exhibit R-2 (PE 0208019F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0208019F Tactical Information Program			PROJECT 4778		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Program Management					0	0	\$ 489			
(U) System Engineering					0	0	\$3,217			
(U) Hardware/Software					0	0	\$6,979			
(U) Total					0	0	\$10,685			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations: (TBD - Estimate release of initial contract by 1 Sep 1998)										
<u>Contractor or</u>	<u>Contract</u>									
<u>Government</u>	<u>Method/Type</u>	<u>Award or</u>	<u>Performing</u>	<u>Project</u>	<u>Total</u>	<u>Budget</u>	<u>Budget</u>	<u>Budget</u>	<u>Budget to</u>	<u>Total</u>
<u>Performing</u>	<u>or Funding</u>	<u>Obligation</u>	<u>Activity</u>	<u>Office</u>	<u>Prior to</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Complete</u>	<u>Program</u>
<u>Activity</u>	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		
<u>Product Development Organizations</u>										
TBD					0	0	0	\$9,074*	TBD	TBD
<u>Support and Management Organizations</u>										
TBD					0	0	0	\$1,496*	TBD	TBD
<u>Test and Evaluation Organizations</u>										
TBD					0	0	0	\$ 115*	TBD	TBD
* Estimated disbursement of FY 1999 funds.										
Project 4778					Page 3 of 4 Pages			Exhibit R-3 (PE 0208019F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0208019F Tactical Information Program				PROJECT 4778	
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>									
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
TBD				0	0	0	TBD	TBD	TBD
<u>Support and Management Property</u>									
TBD				0	0	0	TBD	TBD	TBD
<u>Test and Evaluation Property</u>									
TBD				0	0	0	TBD	TBD	TBD
Subtotal Product Development				0	0	0	\$9,074	TBD	TBD
Subtotal Support and Management				0	0	0	\$1,496	TBD	TBD
Subtotal Test and Evaluation				0	0	0	\$ 115	TBD	TBD
Total Project				0	0	0	\$10,685	TBD	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	4,478	4,489	4,615	4,615	4,525	4,584	4,684	Continuing	TBD
3479 Advanced Sensor Exploitation	812	806	821	817	801	840	841	Continuing	TBD
3480 Automated Imagery Exploitation	1,311	1,302	1,327	1,320	1,292	1,351	1,352	Continuing	TBD
3481 Knowledge Based Tech For Intelligence	1,229	1,265	1,346	1,348	1,323	1,382	1,394	Continuing	TBD
3482 Science & Tech Intelligence Methodology	1,126	1,116	1,121	1,130	1,109	1,011	1,097	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

(U) Intelligence Advanced Development (IAD) demonstrates and validates advanced technology intelligence information systems required to support Global Awareness warfighter needs for timely all source intelligence information. IAD research supports consistent battlespace knowledge, precision information, and the execution of time critical missions. IAD projects provide better real-time information to the warfighter using new and existing data sources, streamline data analysis, reduce footprint required, extend life of sensors in place and enhance performance. Air Force Research Lab Rome Research Site (AFRL/IFE) works directly with users, employing a rapid prototyping evolutionary approach, integrating finished modules directly into the field. The programs are oriented toward specific shortfalls and deficiencies as documented by the major commands (MAJCOMS), unified commands, and intelligence organizations in their mission and function area plans. The goal of this program is to expedite technology transition from the laboratory to operational use via rapid prototyping and simulation. This is the only AF program focused on technology insertion to correct AF intelligence deficiencies at tactical or operation levels. The program is in Demonstration and Validation, Budget Activity 4, because it demonstrates and validates advanced technology which enhances intelligence systems capabilities and techniques.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation		PE NUMBER AND TITLE 0603260F Intelligence Advanced Development		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY98)	4,686	4,738	4,709	TBD
(U) Appropriated Value	4,878	4,738		
U) Adjustments to Appropriated Value				
a. Cong Reductions	(101)	(158)		
b. Small Business Innovative Research	(91)	(93)		
c. Omnibus and other Above Threshold Reprogrammings				
d. BTR				
e. Rescissions	(208)			
(U) Adjustments to Budget Year Since 1998 PB			(94)	
(U) Current Budget Submit/FY1999 President's Budget	4,478	4,489	4,615	TBD
(U) Change Summary Explanation:				
Funding: FY97: Actual reductions consist of general Congressional reductions and SBIR. BTR: Releases from AF to support CSEL requirement.				
Schedule: N/A				
Technical: N/A				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) Not Applicable				
(U) <u>RELATED ACTIVITIES:</u>				
62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, data handling, sensor exploitation				
63789F C3 Advanced Technology Development: correlation, fusion, signal processing				
63726F C3 Subsystem Integration: mass storage, hypermedia database, voice translation, mapping and charting				
64750F Intelligence Equipment: modeling and simulation				

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BUDGET ACTIVITY
4 - Demonstration and Validation

PE NUMBER AND TITLE
0603260F Intelligence Advanced Development

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603260F Intelligence Advanced Development							
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Consistent Operational Picture Initiated				X								
(U) Enhanced Analytical Tools Initiated			X									
(U) Imagery Exploitation 2000 Application Completed				X								
(U) Virtual Data Access Initiated	X											
(U) Video Digital Exploitation Completed				X								
(U) Airborne Range Imagery Algorithm Completed				X								
(U) Secure Image Ciphering using Chaos Theory Initiated/Completed	X			X								
(U) Mass Storage System Completed				X								
(U) Vision Pointer Completed				X								
(U) Multimedia for Information Access Initiated				X								
(U) Intelligence Application Browser Interface Initiated				X								
(U) Predictive Fusion Algorithms Initiate					X							
(U) Virtual Data Access Complete								X				
(U) Speech Technology for Image Exploitation Initiate					X							
(U) Information Integration Technology Initiate					X							
(U) Techniques for Secure Image Information Processing Initiate					X							
(U) Distributed Imagery Infortmation System Integration Initiate					X							
(U) Multi-Processor for Automated Image Exploitation Complete											X	
(U) Speech Technology for Image Exploitation Complete												

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development
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	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Multi Spectral / Hyper Spectral Image Exploitation Application Initiate					X							
(U) Intelligence Analysts Productivity Complete									X			
(U) Multisource Intelligence Notification Systems Prototype Initiated				X								

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3479
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3479 Advanced Sensor Exploitation	812	806	821	817	801	840	841	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

(U) There is an Air Force and Army need to correlate various sources of intelligence reports (Communications Intelligence - COMINT, Electronic Intelligence - ELINT, Image Intelligence - IMINT) within seconds as opposed to hours with current manual methods. Project includes development of data correlation and predictive intelligence algorithms, target analysis and prioritization, air order of battle updates and tactical analysis techniques. This computerized approach will speed up the correlation of data from diverse sources of intelligence information, including COMINT, ELINT, and IMINT; providing faster situational awareness and threat assessment and replace manual systems with automated capabilities.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0603260F Intelligence Advanced Development	3479
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> –(U) \$ 400 Initiated Consistent Operational Picture Via Distributed Fusion for Global Awareness. –(U) \$ 412 Initiated Enhanced Analytical Tools to Support Dynamic Situation Awareness. –(U) \$ 812 Total (Discrete efforts: Three bullet criteria—N/A) <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$ 400 Continue Consistent Operational Picture Via Distributed Fusion for Global Awareness. – (U) \$ 200 Continue Enhanced Analytical Tools to Support Dynamic Situation Awareness. – (U) \$ 206 Initiate Predictive Fusion Algorithms to Support Dynamic Planning – (U) \$ 806 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$ 400 Continue Consistent Operational Picture Via Distributed Fusion for Global Awareness. – (U) \$ 200 Continue Enhanced Analytical Tools to Support Dynamic Situation Awareness. – (U) \$ 221 Continue Predictive Fusion Algorithms to Support Dynamic Planning. – (U) \$ 821 Total 		
Project 3479	Page 6 of 29 Pages	Exhibit R-2 (PE 0603260F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development			PROJECT 3479
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY98)	812	851	838	TBD
(U) Appropriated Value	846	851		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	(18)	(28)		
b. Small Business Innovative Research	(16)	(17)		
c. Omnibus and other Above Threshold Reprogrammings				
d. BTR				
e. Rescissions				
(U) Adjustments to Budget Year Since 1998 PB			(17)	
(U) Current Budget Submit/FY1999 President's Budget	812	806	821	TBD
 (U) Change Summary Explanation:				
Funding: N/A				
Schedule: N/A				
Technical: N/A				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) Not Applicable				
 (U) <u>RELATED ACTIVITIES:</u>				
62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, information handling, sensor exploitation				
63789F C3 Advanced Technology Development: correlation, fusion, signal processing				
63726F C3 Subsystem Integration: advanced image/information, advanced optical memory technology				
64750F Intelligence Equipment: modeling and simulation				
Project 3479	Page 7 of 29 Pages			Exhibit R-2 (PE 0603260F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3479
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Enhanced Analytical Tools Awarded			X									
(U) Consistent Operational Picture Awarded				X								
(U) Predictive Fusion Algorithms Award									X			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3479
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Consistent Operational Picture	400	400	400
(U) Enhanced Analytical Tools	412	200	200
(U) Predictive Fusion Algorithms	0	206	221
(U) Total	812	806	821

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603260F Intelligence Advanced Development				PROJECT 3479	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Electric Computing Concepts	CPFF	Jan 97	N/A	N/A	N/A	412	200	200	Cont.	TBD
BTG, Inc 97-C-0341	CPFF	Aug 97	N/A	N/A	N/A	400	400	400	Cont.	TBD
Contractor TBD	TBD	TBD	TBD	TBD	0	0	206	221	Cont.	TBD
<u>Support and Management Organizations</u> - N/A										
<u>Test and Evaluation Organizations</u> - N/A										
Government Furnished Property: N/A										
Subtotal Product Development						812	806	821	TBD	
Subtotal Support and Management						0	0	0	0	
Subtotal Test and Evaluation						0	0	0	0	
Total Project						812	806	821	TBD	
Project 3479										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3480
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3480 Automated Imagery Exploitation	1,311	1,302	1,327	1,320	1,292	1,351	1,352	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

(U) This project demonstrates and validates the capability to more accurately and quickly interpret digital imagery by evaluating computer assisted techniques to manipulate and overlay imagery, cartographic data, signal intelligence (SIGINT), and on line intelligence data. The result of this effort will be more precise target locations and identifications, precise target reference scenes, and more accurate damage assessments; all developed for easy supportability on low cost commercially available computer workstations. This project will also develop data links which can be used to provide digital imagery to theater and tactical units.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 448 Completed Image Exploitation 2000 Application in Support of Global Awareness and Dynamic Planning
- (U) \$ 145 Initiated Virtual Data Access for Global Awareness and Dynamic Planning.
- (U) \$ 100 Completed Video Digital Image Exploitation for Freeze Frame Analysis.
- (U) \$ 375 Continued Multi-processor for Automated Image Exploitation.
- (U) \$ 134 Completed Airborne Range Imagery Algorithms to Derive Three Dimensional Geographic Locations.
- (U) \$ 109 Initiated/Completed Secure Image Ciphering using Chaos Theory
- (U) \$1,311 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3480
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(U) FY 1998 (\$ in Thousands):

- (U) \$ 400 Complete Virtual Data Access for Global Awareness and Dynamic Planning.
- (U) \$ 300 Continue Multi-Processor for Automated Image Exploitation
- (U) \$ 228 Initiate Speech Technology for Image Exploitation.
- (U) \$ 179 Initiate Information Integration Technology.
- (U) \$ 100 Initiate Techniques for Secure Image Information Processing.
- (U) \$ 95 Initiate Distributed Imagery Information Systems Integration.
- (U) \$1,302 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$ 400 Complete Multi-processor for Automated Image Exploitation.
- (U) \$ 300 Continue Distributed Imagery Information Systems Integration.
- (U) \$ 300 Continue Techniques for Secure Image Information Processing.
- (U) \$ 160 Continue Information Integration Technology.
- (U) \$ 100 Complete Speech Technology for Image Exploitation.
- (U) \$ 67 Initiate Multi Spectral / Hyper Spectral Image Exploitation Applications.
- (U) \$1,327 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development			PROJECT 3480
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY98)	1,311	1,374	1,354	TBD
(U) Appropriated Value	1,365	1,374		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	(28)	(45)		
b. Small Business Innovative Research	(26)	(27)		
c. Omnibus and other Above Threshold Reprogramming				
d. BTR				
e. Rescissions				
(U) Adjustments to Budget Year since 1998 PB			(27)	
(U) Current Budget Submit/FY1999 President's Budget	1,311	1,302	1,327	TBD
 (U) Change Summary Explanation:				
Funding: N/A				
Schedule: N/A				
Technical: N/A				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
 (U) Not Applicable				
 (U) <u>RELATED ACTIVITIES:</u>				
62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, information handling, sensor exploitation				
63789F C3 Advanced Technology Development: correlation, fusion, signal processing				
63726F C3 Subsystem Integration: advanced image/information applications, advanced optical memory technology				
64750F Intelligence Equipment: modeling and simulation				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY					PE NUMBER AND TITLE						PROJECT	
4 - Demonstration and Validation					0603260F Intelligence Advanced Development						3480	
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Imagery Exploitation (IE) 2000 Application Completed				X								
(U) Virtual Data Access Initiated	X											
(U) Video Digital Exploitation Completed				X								
(U) Airborne Range Image Algorithms Completed				X								
(U) Secure Image Cipherng using Chaos Theory Initiated/Completed	X			X								
(U) Virtual Data Access Complete								X				
(U) Speech Technology for Image Exploitation Initiate					X							
(U) Information Integration Technology Initiate					X							
(U) Techniques for Secure Image Information Processing Initiate					X							
(U) Distributed Imagery Information System Integration Initiate					X							
(U) Multi Spectral / Hyper Spectral Image Applications Initiate									X			
(U) Multi processors for Auto Image Exploitation Complete												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	
BUDGET ACTIVITY		February 1998	
4 - Demonstration and Validation	PE NUMBER AND TITLE	PROJECT	
	0603260F Intelligence Advanced Development	3480	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Imagery Exploitation 2000	448		
(U) Virtual Data Access	145	400	
(U) Video Digital Image Exploitation	100		
(U) Multi Processor for Auto Image Exploit	375	300	400
(U) Airborne Range Imagery Algorithms	134		
(U) Secure Image Ciphering	109		
(U) Speech Technology for Image Exploitation		228	100
(U) Information Integration Technology		179	160
(U) Secure Image Information Processing		100	300
(U) Distributed Imagery Information System Integration		95	300
(U) Multi Spectral / Hyper Spectral Image Applications			67
(U) Total	1,311	1,302	1,327

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3480
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Lockheed 95-C-0127	CPFF	Jan 95	N/A	N/A	33	100	0	0	Cont.	TBD
TASC 96-C-0036	CPFF	Feb 96	N/A	N/A	90	134	0	0	Cont.	TBD
Nichols 96-C-0083	CPFF	May 96	N/A	N/A	0	375	418	50	Cont.	TBD
MTL Systems Inc 96-C-0068	CPFF	Mar 96	N/A	N/A	0	145	0	0	Cont.	TBD
PAR Govt Sys Corp 97-C-0093	CPFF	May 96	N/A	N/A	0	448	556	652	Cont.	TBD
State University of NY at Binghamton 97-C-0105	CPFF	Jun 96	N/A		0	109	328	625	Cont.	TBD

Support and Management Organizations - N/A

Test and Evaluation Organizations - N/A

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3480
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: N/A

	Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Subtotal Product Development						123	1,311	1,302	1,327		TBD
Subtotal Support and Management						0	0	0	0		0
Subtotal Test and Evaluation						0	0	0	0		0
Total Project						123	1,311	1,302	1,327		TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603260F Intelligence Advanced Development				PROJECT 3481		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
3481 Knowledge Based Tech For Intelligence	1,229	1,265	1,346	1,348	1,323	1,382	1,394	Continuing	TBD	
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) This project will reduce manpower and warning times for respective Strategic Command (STRATCOM), Air Combat Command (ACC), Air Force Space Command (AFSPC), Air Intelligence Agency (AIA), and 497th Intelligence Group data handling systems. The development of the analytical aids is based on artificial intelligence techniques. The increased timeliness, efficiency and effectiveness derived will provide warning time and accuracy, allowing national/military authorities a greater range of options to avert, diminish or control a crisis.</p> <p>(U) <u>Acquisition Strategy:</u> All major contracts within this Program Element were awarded after full and open competition.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 299 Continued Enhancing Intelligence Analysts Productivity at AIA. - (U) \$ 430 Continued Machine Learning Prototype, expert system and neural network technologies to support real-time analysis of timeliness. - (U) \$ 137 Completed Enhanced Mass Storage System to satisfy the growing need to store and retrieve large digital files representing imagery, charts, maps, text, etc. - (U) \$ 101 Completed the Vision Pointer application which analyzes collected signals and characterizes signals to differentiate between specific platforms. - (U) \$ 200 Initiated Multimedia for information Access for analysts at AIA and users of Image Product Archive (IPA). - (U) \$ 62 Initiated Intelligence Application Browser Interfaces for analysts at ACC and AIA. - (U) \$1,229 Total 										
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0603260F Intelligence Advanced Development	3481
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$ 360 Continue Enhancing Intelligence Analysts Productivity at AIA.- (U) \$ 390 Continue Machine Learning Prototype, expert system and neural network technologies to support real-time analysis of timeliness.- (U) \$ 380 Continue Multimedia for information Access for analysts at AIA and users of Image Product Archive (IPA).- (U) \$ 135 Continue Intelligence Application Browser Interfaces for analysts at ACC and AIA.- (U) \$1,265 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$ 300 Complete Enhancing Intelligence Analysts Productivity at AIA.- (U) \$ 330 Continue Machine Learning Prototype, expert system and neural network technologies to support real-time analysis of timeliness.- (U) \$ 363 Continue Multimedia for information Access for analysts at AIA and users of Image Product Archive (IPA).- (U) \$ 353 Continue Intelligence Application Browser Interfaces for analysts at ACC and AIA.- (U) \$1,346 Total		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development			PROJECT 3481
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY98)	1,437	1,335	1,373	TBD
(U) Appropriated Value	1,496	1,335		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	(31)	(44)		
b. Small Business Innovative Research	(28)	(26)		
c. Omnibus and other Above Threshold Reprogramming				
d. BTR				
e. Rescissions	(208)			
(U) Adjustments to Budget Year since 1998 PB			(27)	
(U) Current Budget Submit/FY1999 President's Budget	1,229	1,265	1,346	TBD
 (U) Change Summary Explanation:				
Funding: N/A				
Schedule: N/A				
Technical: N/A				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) Not Applicable				
 (U) <u>RELATED ACTIVITIES:</u>				
62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, data handling, sensor exploitation				
63789F C3 Advanced Technology Development: correlation, fusion, signal processing				
63726F C3 Subsystem Integration: mass storage, hypermedia database, voice translation, mapping and charting				
64750F Intelligence Equipment: modeling and simulation				
Project 3481	Page 20 of 29 Pages			Exhibit R-2 (PE 0603260F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603260F Intelligence Advanced Development						PROJECT 3481	
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Enhanced Mass Storage System Completed				X								
(U) Vision Pointer Completed				X								
(U) Multimedia Information Access Initiated				X								
(U) Intelligence Application Browser Interfaces Initiated				X								
(U) Intel Analysts Productivity Completed											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3481
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Intelligence Analysts Productivity	299	360	300
(U) Machine Learning Prototype	430	390	330
(U) Enhanced Mass Storage System	137		
(U) Vision Pointer	101		
(U) Multimedia for Information Access	200	380	363
(U) Intelligence Applications Browser Interfaces	62	135	353
(U) Total	1,229	1,265	1,346

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE		
								February 1998		
BUDGET ACTIVITY					PE NUMBER AND TITLE			PROJECT		
4 - Demonstration and Validation					0603260F Intelligence Advanced Development			3481		
Government Furnished Property: N/A										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Subtotal Product Development					925	1,229	1,265	1,346		TBD
Subtotal Support and Management					0	0	0	0		0
Subtotal Test and Evaluation					0	0	0	0		0
Total Project					925	1,229	1,265	1,346		TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603260F Intelligence Advanced Development				PROJECT 3482	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3482 Science & Tech Intelligence Methodology	1,126	1,116	1,121	1,130	1,109	1,011	1,097	Continuing	TBD
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) Demonstrates and validates intelligence methodologies and techniques for operational employment of simulation models in support of Air Intelligence Agency (AIA) requirements. The methods and techniques will help AIA improve their analysis of current and future foreign weapon systems, and prevent technological surprises with regard to the capabilities of these systems. The program is Demonstration and Validation, Budget Activity 4.</p> <p>(U) <u>Acquisition Strategy:</u> All major contracts within this Program Element were awarded after full and open competition.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 500 Continued Applied Deception Techniques for Manipulative Deception of Foreign Signal Collection Systems. - (U) \$ 626 Continued Intelligence Analyst Associate (Build 2) for Automated Information Extraction from Text using Natural Language Understanding. - (U) \$1,126 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 400 Continue Applied Deception Techniques for Manipulative Deception of Foreign Signal Collection Systems - (U) \$ 400 Continue Intelligence Analyst Associate (Build 2) for Automated Information Extraction - (U) \$ 316 Continue Multisource Intelligence Notification Systems (MINS) Prototype. - (U) \$ 1,116 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 400 Complete Applied Deception Techniques for Manipulative Deception of Foreign Signal Collection Systems - (U) \$ 400 Continue Intelligence Analyst Associate (Build 2) for Automated Information Extraction - (U) \$ 321 Continue Multisource Intelligence Notification Systems (MINS) Prototype. - (U) \$ 1,121 Total 									
Project 3482			Page 25 of 29 Pages				Exhibit R-2 (PE 0603260F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development			PROJECT 3482
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY98)	1,126	1,178	1,144	TBD
(U) Appropriated Value	1,171	1,178		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	(24)	(39)		
b. Small Business Innovative Research	(21)	(23)		
c. Omnibus and other Above Threshold Reprogramming				
d. BTR				
e. Rescissions				
(U) Adjustments to Budget Year since 1998 PB			(23)	
(U) Current Budget Submit/FY1999 President's Budget	1,126	1,116	1,121	TBD
 (U) Change Summary Explanation:				
Funding: N/A				
Schedule: N/A				
Technical N/A				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) Not Applicable				
 (U) <u>RELATED ACTIVITIES:</u>				
62720F C3I Exploratory Development: optical storage, speech processing, signals exploitation, data handling, sensor exploitation				
63789F C3 Advanced Technology Development: correlation, fusion, signal processing				
63726F C3 Subsystem Integration: mass storage, hypermedia database, voice translation, mapping and charting				
64750F Intelligence Equipment: modeling and simulation				
 Project 3482				
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Exhibit R-2 (PE 0603260F)				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603260F Intelligence Advanced Development	PROJECT 3482
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Multisource Intelligence Notification System (MINS) Prototype Initiated							X					
(U) Applied Deception Techniques Completed									X			
(U) Intel Analyst Associate (Build 2) Completed												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603260F Intelligence Advanced Development			PROJECT 3482		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Applied Deception Techniques				500	400	400			
(U)	Intelligence Analysts Associate (Build 2)				626	400	400			
(U)	Multisource Intelligence Notofocation System (MINS) Prototype					316	321			
(U)	Total				1,126	1,116	1,121			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Calspan	CPFF	Sep 96	N/A	N/A	87	626	400	400	Cont.	TBD
96-C-0108										
E-Systems	CPFF	Sep 96	N/A	N/A	19	500	400	400	Cont.	TBD
96-C-0194										
Contractor TBD	TBD	TBD			0	0	316	321	Cont.	TBD
<u>Support and Management Organizations</u> - N/A										
<u>Test and Evaluation Organizations</u> - N/A										
Project 3482					Page 28 of 29 Pages			Exhibit R-3 (PE 0603260F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603319F Airborne Laser Program	PROJECT 4269
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4269 Airborne Laser	56,037	151,439	292,219	314,242	150,739	175,954	152,580	0*	1,336,718*
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* The FY98 President's Budget (PB) R-2 submission included the cost of both Airborne Laser (ABL) Program Definition and Risk Reduction (PDRR) and Engineering and Manufacturing Development (EMD) in this PE 0603319F line. Since then, the AF has created PE 0604350F (BPAC 654687) for ABL EMD costs, moved the FY 2003 EMD costs to the new PE, and realigned EMD funding beyond the FYDP to PE 0604350F. The Total Cost now reflects cost for Concept Design and PDRR only and contains \$43,508 in funds prior to FY 1997.

**This Qty is for the acquisition of commercial 747-400F freighter aircraft. These aircraft are incrementally funded beginning in the years identified.

(U) A. Mission Description and Budget Item Justification:

The Airborne Laser (ABL) Program is an ACAT 1D program which will design, build and test a laser weapon system to acquire, track and kill Theater Ballistic Missiles (TBMs) in the boost phase. This weapon system integrates three major subsystems (Laser, Beam Control and Battle Management Command, Control, Communications, Computers and Intelligence (BMC4I)) into a modified commercial Boeing 747-400F aircraft. The program awarded the ABL PDRR contract to the Boeing/TRW/Lockheed-Martin team in November 1996, to design, fabricate, integrate, and test the half-power ABL system. The PDRR phase culminates with a lethality (missile shoot-down) demonstration against a boosting TBM representative target in FY 2002. The PDRR phase will integrate and test all key technologies needed for a fully operational system, allowing the Air Force to advance into EMD in FY 2003. This program is in budget activity 4 - Demonstration and Validation since it is a major defense acquisition program which has been authorized to enter PDRR as of the Milestone I, November 1996.

(U) Acquisition Strategy:

Milestone (MS) I decision was November 1996 authorizing entry into PDRR; MS II for EMD in FY 2003; MS III Decision for Production in FY 2005. The PDRR program is structured to demonstrate technical risk reduction achievements at key junctures throughout the PDRR phase. The Air Force Service Acquisition Executive will review the program at two key points (Authority-to-Proceed I & II) during PDRR to ensure planned progress is attained. PDRR culminates with a lethality (missile shoot-down) demonstration against a boosting theater ballistic missile in FY 2002.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		February 1998
4 - Demonstration and Validation	PE NUMBER AND TITLE	PROJECT
	0603319F Airborne Laser Program	4269
(U) FY 1997 (\$ in Thousands):		
– (U) \$ 9,731	Completed both Concept Design contracts	
– (U) \$31,898	Initiated Boeing/TRW/Lockheed-Martin PDRR contract effort for design, fabrication, integration, and test the ABL weapon system	
– (U) \$ 255	Completed Environmental Impact Analysis contract	
– (U) \$ 4,829	Support for special studies, simulations and analyses, technical support, risk management, and an independent review team specializing in lasers, aircraft, and aircraft integration	
– (U) \$ 9,324	Support for atmospheric characterization tests, labor, training, Integrated Product Team (IPT) participation, and other government agencies	
– (U) \$56,037	Total	
(U) FY 1998 (\$ in Thousands):		
– (U) \$137,456	Continue Boeing/TRW/Lockheed-Martin PDRR contract effort for design, fabrication, integration, and test the ABL weapon system	
– (U) \$ 700	Minor modification to Birk facility at Edwards AFB, CA by Boeing/TRW/Lockheed-Martin. Project number FSPM981305. Project title: Airborne Laser Complex Upgrade	
– (U) \$ 4,090	Support for special studies, simulations and analyses, technical support, risk management, and an independent review team specializing in lasers, aircraft, and aircraft integration	
– (U) \$ 9,143	Support for atmospheric characterization tests, labor, training, Integrated Product Team (IPT) participation, and other government agencies	
– (U) \$ 50	Government support to contractor modification to Birk facility at Edwards AFB, CA. Project number FSPM981305.	
– (U) \$151,439	Total	
(U) FY 1999 (\$ in Thousands):		
– (U) \$281,733	Continue Boeing/TRW/Lockheed-Martin PDRR contract effort for design, fabrication, integration, and test the ABL weapon system	
– (U) \$ 1,825	Minor modification to Birk facility at Edwards AFB, CA by Boeing/TRW/Lockheed-Martin. Project number FSPM981305. Project title: Airborne Laser Complex Upgrade	
– (U) \$ 3,970	Support for special studies, simulations and analyses, technical support, risk management, and an independent review team specializing in lasers, aircraft, and aircraft integration	
– (U) \$ 4,516	Support for labor, training, Integrated Product Team (IPT) participation, and other government agencies	
– (U) \$ 175	Government support to contractor modification to Birk facility at Edwards AFB, CA. Project number FSPM981305.	
– (U) \$292,219	Total	
Project 4269	Page 2 of 7 Pages	Exhibit R-2 (PE 0603319F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603319F Airborne Laser Program	PROJECT 4269
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget FY 1998 PB	54,227	157,136	296,596	2,524,994
(U) Appropriated Value	56,828	157,136		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,210	-5,697		
b. SBIR	-1,391			
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	1,900			
e. Recissions	-90			
(U) Adjustments to Budget Years Since FY 1998 PB			-4,377	
(U) Current Budget Submit/FY 1999 PB	56,037	151,439	292,219	1,336,718

(U) Change Summary Explanation:

Funding: Added \$1,900 in FY 1997 to support atmospheric characterization data collection efforts and adjunct mission studies. FY 1999 funding reduced by \$4,377 due to downward revision in inflation estimates and other DoD adjustments. Beginning in FY 2003, \$1,118,300 has been realigned to the EMD PE 0604350F.

Schedule: Funding reductions in FY 1998 slip the completion of initial adjunct mission studies 1 year.

Technical: FY 1998 adjustments caused curtailment of participation in Roving Sands 98 and Tactical Weather Decision Aids effort. FY 1999 - FY 2003 funding reductions cause cancellation of all target lethality, enemy countermeasures efforts, and atmospheric data collection and analysis, thereby increasing overall ABL program risk.

		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603319F Airborne Laser Program	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603319F Airborne Laser Program	PROJECT 4269
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(U) C. Other Program Funding Summary (\$ in Thousands)

(U) RELATED ACTIVITIES:

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) PE 0604350F Airborne Laser EMD	0	0	0	0	0	0	242,843	866,300	1,109,143
(U) PE 0603605F Advance Weapons Technology Project 3647 - High Energy Laser Technologies*									Continuing

* This effort is developing technologies for potential performance enhancements above current requirements identified in the ABL Operational Requirements Document (ORD) .

(U) D. Schedule Profile

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>
(U) Award PDRR Contract	1	2	3	4	1	2	3	4	1
(U) Completed Concept Design	X								
(U) Program Requirements Review		X							
(U) Order PDRR "Green" Aircraft					X				
(U) Flight-weighted Laser Module Demo						X			
(U) Preliminary Design Review						X			
(U) Authority to Proceed (ATP) - 1						X			
(U) Laser Module Airworthiness Demo							X		
(U) Laser Module Scaling Demo								X	
(U) Critical Design Review									X
(U) Lethality Demonstration (FY 2002)									
(U) Milestone II (FY 2003)									
(U) Milestone III (FY 2005)									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603319F Airborne Laser Program				PROJECT 4269		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Major Contracts (PDRR contract and Concept Design)				41,629	138,156	283,558				
(U) Support Contracts (Technical Support, Analysis)				5,084	4,090	3,970				
(U) Test/Other Government/Misc Support/Salaries/IPTs				9,324	9,193	4,691				
(U) Total				56,037	151,439	292,219				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Boeing Defense & Space Group Seattle, WA *	CPAF	12 Nov 96	1,153,605	1,214,478	0	31,898	138,156	283,558	760,866	1,214,478
Concept Design Contract (Rockwell International, CA)	CPFF	9 May 94	21,395	21,395	16,780	4,615	0	0	0	21,395
Concept Design Contract (Boeing Defense & Space Group, WA)	CPFF	9 May 94	21,689	21,689	16,573	5,116	0	0	0	21,689
Project 4269										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603319F Airborne Laser Program				PROJECT 4269	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
Technical Support Contracts	Various	Varies	N/A	N/A	5,800	5,084	4,090	3,970	4,340	23,284
Government In-House and Other External Support	Various	Varies	N/A	N/A	4,355	9,180	8,593	1,491	5,753	29,372
<u>Test and Evaluation Organizations</u>										
Air Force Flight Test Center (AFFTC) **	MIPR	Varies	N/A	N/A	0	144	600	3,200	22,556	26,500
Government Furnished Property: None										
NOTES:										
* Project Office EAC was approved at the time of contract award and has been updated to reflect contract changes to date. Project Office EAC includes funds budgeted for risk mitigation identified during Source Selection. Since the FY 1998 PB, the Performing Activity's EAC has been adjusted upward to account for two risk mitigation efforts -- additional Software Lines of Code (SLOC) and Advanced Adaptive Optics (AAO).										
** AFFTC is the single face to the customer for Test and Evaluation. AFFTC receives funding from the Program Office and controls the distribution of these funds within AFFTC, the White Sands Missile Range (WSMR) and the Western Test Range (WTR).										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603319F Airborne Laser Program	PROJECT 4269
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				33,353	41,629	138,156	283,558	760,866	1,257,562
Subtotal Support and Management				10,155	14,264	12,683	5,461	10,093	52,656
Subtotal Test and Evaluation				0	144	600	3,200	22,556	26,500
Total Project				43,508	56,037	151,439	292,219	793,515	1,336,718

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603430F Advanced MILSATCOM (Space)	PROJECT 4050
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4050 Advanced MILSATCOM	32,403	38,307	54,413	52,326	234,315	481,569	497,821	2,582,960	4,024,943
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Develop and acquire Advanced Extremely High Frequency (EHF) Military Satellite Communications (MILSATCOM) satellites with necessary modifications to the mission control segment for survivable, jam-resistant, worldwide, secure communications for the strategic and tactical warfighter. Advanced EHF satellites will replenish the existing EHF (Milstar) system. It will use many components from standard commercial buses and will launch on a medium launch vehicle. The Advanced EHF capability will be available for first launch not later than 2006. Activities funded under this program element implement the Secretary of Defense's 1993 MILSATCOM Bottom Up Review decision to field a lower cost, advanced MILSATCOM satellite. The Advanced EHF program implements the architecture defined by the DoD Space Architect and directed by the Joint Space Management Board. This program is in Budget Activity 4, Research Category Demonstration and Validation, since it funds technology validation and fabrication of an Advanced EHF satellite system.

Acquisition Strategy: The Advanced MILSATCOM strategy is a competitive acquisition between two contractors. One contractor will be selected to perform engineering and manufacturing development and fabrication of five satellites. Advanced MILSATCOM will incorporate improvements from Milstar and commercial SATCOM practices into the next generation EHF military communication satellite system.

(U) FY 1997

- (U)\$ 14,303 Continued Advanced EHF technology validation.
- (U)\$ 15,100 Initiated processing Subsystem Engineering Model Program.
- (U)\$ 1,000 Continued Advanced Technology Program basic Program Office support activities.
- (U)\$ 2,000 Funded Joint Terminal Engineering Office (JTEO).
- (U)\$ 32,403 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603430F Advanced MILSATCOM (Space)	PROJECT 4050																																																							
<p>(U) <u>FY 1998</u></p> <ul style="list-style-type: none"> - (U)\$ 2,145 Continue Advanced EHF technology validation. - (U)\$ 36,000 Continue processing Subsystem Engineering Model Program. - (U)\$ 162 Continue Advanced Technology Program basic Program Office support activities. - (U)\$ 38,307 Total <p>(U) <u>FY 1999</u></p> <ul style="list-style-type: none"> - (U)\$ 1,761 Continue Advanced EHF technology validation. - (U)\$ 52,486 Continue processing Subsystem Engineering Model Program. - (U)\$ 166 Continue Advanced Technology Program basic Program Office support activities. - (U)\$ 54,413 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;"></th> <th style="text-align: right; width: 10%;"><u>FY 1997</u></th> <th style="text-align: right; width: 10%;"><u>FY 1998</u></th> <th style="text-align: right; width: 10%;"><u>FY 1999</u></th> <th style="text-align: right; width: 10%;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">30,453</td> <td style="text-align: right;">41,448</td> <td style="text-align: right;">59,507</td> <td style="text-align: right;">3,666,604</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">31,643</td> <td style="text-align: right;">41,000</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional General Reductions</td> <td style="text-align: right;">-846</td> <td style="text-align: right;">-2,693</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-344</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus and Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogram</td> <td style="text-align: right;">2,000</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: right;">-50</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-5,094</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">32,403</td> <td style="text-align: right;">38,307</td> <td style="text-align: right;">54,413</td> <td style="text-align: right;">4,024,943</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: \$2M FY97 Below Threshold Reprogramming action funded Joint Terminal Engineering Office (JTEO) activities. FY99 Engineering Model and technology validation funding reduced to accommodate higher priority AF requirements. Schedule: None. Technical: None.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY 1998 PB)	30,453	41,448	59,507	3,666,604	(U) Appropriated Value	31,643	41,000			(U) Adjustments to Appropriated Value					a. Congressional General Reductions	-846	-2,693			b. SBIR	-344				c. Omnibus and Other Above Threshold Reprogram					d. Below Threshold Reprogram	2,000				e. Rescissions	-50				(U) Adjustments to Budget Years Since FY 1998 PB			-5,094		(U) Current Budget Submit/FY 1999 President's Budget	32,403	38,307	54,413	4,024,943
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Project 4050	Page 2 of 5 Pages	Exhibit R-2 (PE 0603430F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603430F Advanced MILSATCOM (Space)			PROJECT 4050		
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To Complete	Total Cost
(U) Not Applicable.									
(U) <u>Related RDT&E:</u>									
(U) PE 0604479F, Milstar LDR/MDR Satellite Communications									
(U) PE 0604577N, EHF Satellite Communications									
(U) PE 0603432F, Polar Satellite Communications Program (Polar Adjunct)									
(U) D. <u>Schedule Profile</u>									
		<u>FY 1997</u>			<u>FY 1998</u>		<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1
(U) Technology Project Awards/Renewals		x				x			x
(U) Start Processing Subsystem Engineering Model			x						
(U) System Definition 1QFY00									
(U) Milestone II - Mid FY00									
(U) EHF program EMD Start - Mid FY01									
(U) First Delivery - FY06									
Project 4050									
Page 3 of 5 Pages									
Exhibit R-2 (PE 0603430F)									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603430F Advanced MILSATCOM (Space)				PROJECT 4050	
(U) A. Project Cost Breakdown (\$ in Thousands)					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) MILSATCOM Technology Validation Program					14,303	2,145	1,761			
(U) Processing Subsystem Engineering Model					15,100	36,000	52,486			
(U) Architecture & Requirements Definition					0	0	0			
(U) Other Government Costs					3,000	162	166			
(U) Total					32,403	38,307	54,413			
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government	Contract Method/Type	Award or Obligation	Performing Activity	Project Office	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Activity</u>	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
<u>Product Development Organizations</u>										
MIT/LL	MIPR	Feb 95	6,258	6,258	4,300	2,000	1,500	1,761	922	10,483
Lockheed	CPFF	Jan 95	7,604	7,604	5,336	2,268	0	0	0	7,604
Hughes	CPFF	Jan 95	2,486	2,486	2,486	0	0	0	0	2,486
TRW	CPFF	Jan 95	4,850	4,850	3,408	1,442	0	0	0	4,850
TRW	CPFF	Feb 95	1,071	1,071	1,071	0	0	0	0	1,071
HSC/Loral	CPFF	Jan 95	4,777	4,777	3,196	1,581	0	0	0	4,777
Boeing	CPFF	Jan 95	3,648	3,648	2,779	869	0	0	0	3,648
TRW	CPFF	Feb 95	2,998	2,998	2,572	426	0	0	0	2,998
Texas Instruments	CPFF	Jan 95	3,215	3,215	2,452	763	0	0	0	3,215
MIT/LL	MIPR	Feb 95	3,800	3,800	2,400	1,200	0	0	0	3,600
Various Tech Proj	Various	Jan 95	29,886	29,886	14,690	3,754	645	0	0	19,089
Arch Requirements	Various	Jan 96	4,809	4,809	4,809	0	0	0	0	4,809
Hughes	CPFF	May 97	15,100	15,100	0	8,100	19,200	26,718	15,254	69,272
TRW	CPFF	May 97				7,000	16,800	25,768	13,346	62,914
JTEO		Jul 97	2,000	2,000	0	2,000	0	0	79,017	81,017
Project 4050					Page 4 of 5 Pages			Exhibit R-3 (PE 0603430F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603430F Advanced MILSATCOM (Space)				PROJECT 4050	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
TBD	TBD	TBD	TBD	TBD	0	0	0	0	3,427,757	3,427,757
<u>Support and Management Organizations</u>										
Various	Various	2Q95	N/A	N/A	1,330	1,000	162	166	312,695	315,353
<u>Test and Evaluation Organizations</u>										
TBD										
Government Furnished Property:										
None										
Subtotal Product Development					49,499	31,403	38,145	54,247	3,536,296	3,709,590
Subtotal Support and Management					1,330	1,000	162	166	312,695	315,353
Subtotal Test and Evaluation					0	0	0	0	TBD	TBD
Total Project					50,829	32,403	38,307	54,413	3,848,991	4,024,943

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603432F Polar Adjunct (Space)	PROJECT 4052
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4052 Polar Satellite Communications	59,439	14,511	41,508	40,429	26,771	13,325	8,863	TBD	TBD
Quantity of RDT&E Articles	1	0	0	0	0	0	1	0	0

(U) A. Mission Description and Budget Item Justification

The Program will provide protected communications services to U.S. forces operating in the northern polar region. In 1992, the Milstar program was restructured, and the requirement for Milstar to provide polar coverage was deleted. The Air Force was directed to find a more cost-effective solution to polar requirements. In Oct 94, the DoD identified an immediate need for protected polar communications, and in Jul 95, the Joint Requirements Oversight Council (JROC) validated the Polar MILSATCOM ORD which contained the interim requirements. In July 95, the Defense Acquisition Executive reviewed the Polar program and approved execution of an interim program to place a modified Extremely High Frequency (EHF) payload from the Navy's UHF Follow On (UFO) system onto a host satellite to provide limited requirements satisfaction while pursuing a long term solution. In Aug 96, the Joint Space Management Board (JSMB) addressed that long term solution by approving proposals from the DoD Space Architect to "sustain EHF Polar capability through about 2010 (24 hours)". In Nov 97, the first package was launched on a classified host satellite. This program provides for design, integration and launch of two more packages by the classified host program office. The Polar Satellite Communications Program is in Budget Activity 4, Demonstration and Validation, based on a 30 Mar 95 USD(A&T) memorandum to pursue the interim hosted solution (Interim Polar).

Acquisition Strategy: Hosted package on classified satellites. Classified program office does not provide funding in greater detail than what is presented below.

(U) FY 1997 (\$ in Thousands):

- (U) \$20,831 Complete design, satellite modification, and payload integration and test for the interim payload. (Through the classified host contract)
- (U) \$38,608 Continue integration and test activities for Polar package 1 and initiate planning for Polar package 2. (Through the classified host contract)
- (U) \$59,439 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$14,511 Continue Polar package planning and design for the next generation payload, initiate parts procurement for Polar packages 2 and 3, and develop payload. (Through the classified host contract)
- (U) \$14,511 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$41,508 Continue payload development and integration development with host vehicle for Polar packages 2 and 3. (Through the classified host contract)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603432F Polar Adjunct (Space)	PROJECT 4052			
- (U) \$41,508 Total					
(U) B. <u>Program Change Summary (\$ in Thousands)</u>					
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	
(U) Previous President's Budget (FY 1998 PB)	59,537	29,585	30,643	TBD	
(U) Appropriated Value	62,387	15,000			
(U) Adjustments to Appropriated Value					
(U) a. Congressional General Reductions	-1,306	-489			
(U) b. SBIR	-1,544				
(U) c. Omnibus/Other Above Threshold Reprogramming					
(U) d. Below Threshold Reprogramming					
(U) e. Rescissions	-98				
(U) Adjustments to Budget Years Since FY98 PB			+10,865		
(U) Current Budget Submit/FY 1999 President's Budget	59,439	14,511	41,508	TBD	
 (U) Change summary explanation:					
Funding: FY99 adjusted to add funding for two additional polar packages (Polar numbers 2 and 3).					
Schedule: None.					
Technical: None					
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>					
PE 0302109N Navy SATCOM Ship Terminals.					
 (U) D. <u>Schedule Profile</u>					
	<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>
	1 2 3 4	1	2 3 4	1	2 3 4
Launch Hosted Interim Payload (Polar Package 1)					
Polar package 2 launch FY03			X		
Polar package 3 launch FY04					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603432F Polar Adjunct (Space)				PROJECT 4052	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Package 1 Fabrication					20,831					
(U) Package 1 Integration/Test					38,608					
(U) Packages 2 & 3 Integration Development and Parts Buy						14,511	41,508			
(U) Total					59,439	14,511	41,508			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Classified	Classified	June 95	Continuing	Continuing	73,457	59,439	14,511	41,508	TBD	TBD
<u>Support and Management Organizations</u> None										
<u>Test and Evaluation Organizations</u> None										
Government Furnished Property:										
Product Development Property - None										
Support and Management Property - None										
Test and Evaluation Property - None										
Subtotal Product Development					73,457	59,439	14,511	41,508	TBD	TBD
Subtotal Support and Management					0	0	0	0		
Subtotal Test and Evaluation					0	0	0	0		
Total Project					73,457	59,439	14,511	41,508	TBD	TBD
Project 4052										
Page 3 of 3 Pages										
Exhibit R-3 (PE 0603432F)										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603434F National Polar-orbiting Operational Environmental Satellite System (NPOESS) (Space)				PROJECT 4056	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4056 National Polar-orbiting Operational Env. Sat. Syst.	27,622	31,438	64,732	95,646	132,260	214,861	257,319	TBD	TBD
Quantity of RDT&E Articles	0	0	0	0	1*	0	0	1	2

* Initiates first RDT&E spacecraft bus build.

(U) A. Mission Description and Budget Item Justification
 The National Performance Review (NPR) and subsequent Presidential Decision Directive/NSTC-2 (May 1994) direct the Departments of Defense (DoD) and Commerce (DOC) and the National Aeronautics and Space Administration to establish a converged national weather satellite program. The converged program, the National Polar-orbiting Operational Environmental Satellite System (NPOESS), will combine the follow-on to DoD's Defense Meteorological Satellite Program (DMSP) and the DOC's Polar-orbiting Operational Environmental Satellite (POES) program. An integrated tri-agency program office was established on 1 Oct 94 to manage the acquisition and operations of the converged satellite. NPOESS will provide operational military commanders and civilian leaders timely, quality weather information to effectively employ weapon systems and protect national resources. The converged program will be the nation's single source of global weather data for operational DoD and DOC use. It will provide visible and infrared cloud cover imagery and other meteorological, oceanographic, and solar-geophysical information. At least three satellites (two U.S. and one European) will be required in sun synchronous 450 nm polar orbit at all times (sun synchronous means the satellites cross the equator at the same local sun time on each of their 14 orbits/day). On 17 March 1997, NPOESS successfully completed Milestone I. DOC and Air Force budget adjustments, in the fall of 1997, reduced NPOESS funding below the Milestone I approved program. The program was subsequently rebaselined and approved by the Executive Committee (EXCOM). DoD and DOC equally funded the rebaselined NPOESS program to maintain a 50/50 cost share ratio by year. This PE is in Budget Activity 4 (Demonstration and Validation) because it currently supports sensor and satellite bus development.

(U) Acquisition Strategy
 The guiding tenets for NPOESS acquisition include accomplishing substantial risk reduction with a focus on payload development, accelerating user satisfaction, deferring major system decisions as long as reasonable, and protecting maximum flexibility to ensure the best overall system design. The program pursues a significant investment in the development and on-orbit testing of selected payload sensors while deferring individual sensor selections among competing international, NASA, military, and industry alternatives to assess and determine the optimum technical performance potential of each candidate sensor. Overall system prime contractor selection is being deferred to minimize system level preliminary costs, allow sensor compliment maturation, and delay the commitment to full system acquisition until approximately seven years before the first satellite need date.

Project 4056
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603434F National Polar-orbiting Operational Environmental Satellite System (NPOESS) (Space)	PROJECT 4056
<p>(U) <u>FY 1997 (\$ in Thousands)</u></p> <ul style="list-style-type: none"> - (U) \$ 4,510 Continued system architecture studies. - (U) \$ 6,037 Continued Program Definition and Risk Reduction efforts. - (U) \$ 8,045 Continued Milestone I Review, began critical sensor and algorithm development with multiple contractors. - (U) \$ 9,030 Continued Government-led risk reduction and technology development efforts. - (U) \$ 27,622 Total <p>(U) <u>FY 1998 (\$ in Thousands)</u></p> <ul style="list-style-type: none"> - (U) \$ 976 Continue to support Program Definition and Risk Reduction efforts. - (U) \$ 3,000 Continue system architecture studies. - (U) \$ 3,850 Continue Government-led risk reduction and technology development efforts. - (U) \$ 23,612 Continue critical sensor/algorithm development efforts. - (U) \$ 31,438 Total <p>(U) <u>FY 1999 (\$ in Thousands)</u></p> <ul style="list-style-type: none"> - (U) \$ 2,500 Continue to support Program Definition and Risk Reduction efforts. - (U) \$ 4,600 Complete system architecture studies and initiate system definition contracts. - (U) \$ 6,800 Continue Government-led risk reduction and technology development efforts. - (U) \$ 50,832 Continue critical sensor development. - (U) \$ 64,732 Total 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603434F National Polar-orbiting Operational Environmental Satellite System (NPOESS) (Space)						PROJECT 4056	
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Milestone 1 Review		X										
(U) Request for Proposal for sensor development		X										
(U) Sensor and Algorithm Development Contract Awards (6 Separate Contracts)				X								
(U) Program Rebaselined					X							
(U) Selected Sensor Downselects									X		X	X
(U) Complete System Architecture Studies										X		
(U) Award NPOESS System Definition Contracts												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603434F National Polar-orbiting Operational Environmental Satellite System (NPOESS) (Space)	PROJECT 4056

(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) System Architecture Studies/Definition & C3	4,510	3,000	4,600
(U) Government Led Risk Reduction/ Technology efforts	9,030	3,850	6,800
(U) Program Definition and Risk Reduction (sensor development) contracts/ Program Support	14,082	24,588	53,332
(U) Total	27,622	31,438	64,732

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Product Development Organizations										
System Arch./Defin. & C3	C/CPFF	Sep 96	TBD*	TBD*	5,310	4,510	3,000	4,600	TBD*	TBD*
Lockheed	C/CPAF	2QFY95	Comp	Comp	4,489	0	0	0	0	4,489
Hughes Aircraft Co	CPFF	Jul 97	TBD	TBD	0	1,402	7,005	9,275	TBD*	TBD*
Ball Aerospace	CPFF	Jul 97	TBD	TBD	0	1,402	2,096	5,375	TBD*	TBD*
ITT Aerospace	CPFF	Jul 97	TBD	TBD	0	1,402	7,005	9,275	TBD*	TBD*
Hughes Space and Communications	CPFF	Jul 97	TBD	TBD	0	701	1,373	4,525	TBD*	TBD*
Orbital Sciences	CPFF	Jul 97	2,275	2,275	0	702	723	850	0	2,275
SAAB Erickson	FFP	Jul 97	2,086	2,086	0	701	1,685	0	0	2,086

* The IPO is currently restructuring the existing contracts to meet the new funding levels.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603434F National Polar-orbiting Operational Environmental Satellite System (NPOESS) (Space)				PROJECT 4056	
Contractor or Government Performing <u>Activity</u> Other PDRR & Follow-on efforts Gov't Led Studies	Contract Method/Type or Funding <u>Vehicle</u> MISC Gov. Orgs.	Award or Obligation <u>Date</u> Various MISC.	Performing Activity <u>EAC</u> TBD TBD*	Project Office <u>EAC</u> TBD TBD*	Total Prior to <u>FY 1997</u> 0 8,550	Budget <u>FY 1997</u> 1,735 9,030	Budget <u>FY 1998</u> 3,725 3,850	Budget <u>FY 1999</u> 21,532 6,800	Budget to <u>Complete</u> TBD TBD*	Total <u>Program</u> TBD TBD*
<u>Support and Management Organizations</u>										
Integrated Program Office (IPO) Support	Various	Various	N/A	N/A	6,396	6,037	976	2,500	TBD**	TBD**
<u>Test and Evaluation Organizations</u>										
TBD**									TBD**	TBD**
Government Furnished Property:										
Not Applicable.										
Subtotal Product Development*					18,349	21,585	30,462	62,232	TBD**	TBD**
Subtotal Support and Management					6,396	6,037	976	2,500	TBD**	TBD**
Subtotal Test and Evaluation										
Project Total					24,745	27,622	31,438	64,732	TBD**	TBD**
* Includes all program phases										
** The IPO is currently restructuring the existing contracts to meet the rebaselined program funding levels.										

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603441F Space Based IR Arch (Dem/Val) (Space)
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COST (In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	252,492	202,433	160,262	154,133	115,398	0	0	0	1,432,558
0007 SBIRS Low	241,493	199,677	160,262	154,133	115,398	0	0	0	1,397,992
0008 Cobra Brass	10,999	2,756	0	0	0	0	0	0	34,566
Quantity of RDT&E Articles	0	0	0	3	0	0	0	0	3

Note: SBIRS Low EMD activities are funded in PE #0604442F starting in FY01.

(U) A. Mission Description and Budget Item Justification

(U) The Space-Based Infrared System's (SBIRS) primary mission is to provide initial warning of a ballistic missile attack on the US, its deployed forces or its allies. SBIRS will incorporate new technologies to enhance detection; improve reporting of Intercontinental Ballistic Missiles (ICBM), Submarine Launched Ballistic Missiles (SLBM) and tactical ballistic missiles; and provide critical mid-course tracking and discrimination data for national and theater missile defense. This system will provide increased performance in order to meet requirements in US Space Command's Capstone Requirement Document and Operational Requirements Document. SBIRS will consist of satellites in Geosynchronous Orbits (GEO), Highly Elliptical Orbits (HEO) and Low Earth Orbits (LEO) and an integrated centralized ground station serving all SBIRS space elements and the Defense Support System (DSP) satellites. PE #305911F funds DSP, PE#604442 funds SBIRS Low Engineering and Manufacturing Development (EMD) at deployment and PE #604441F funds SBIRS High EMD activities.

(U) This PE funds the SBIRS Low Program Definition and Risk Reduction (PDRR) activities and Cobra Brass (CB). SBIRS Low is the LEO component of SBIRS. CB will provide data primarily for the Defense Intelligence Agency (DIA)/Central MASINT (Measurement and Signature Intelligence) Office (CMO), and secondarily for the GEO and HEO components. This program is funded in Budget Activity 4, Demonstration and Validation, because it funds risk reduction and an advanced technology demonstration system.

(U) Acquisition Strategy:

(U) The SBIRS program is managed through a single consolidated System Program Office (SPO) at the Space and Missile Systems Center, Los Angeles Air Force Base, CA. The SBIRS Low Flight Demonstration System (FDS) acquisition plan was approved in Aug 92. The FDS contract was awarded to TRW in May 95, and two FDS satellites are scheduled to launch 1QFY00. To maintain competition for the EMD phase of the program, a second Competitive Dem/Val contract was awarded (3 Sep 96) to Boeing/Lockheed-Martin for work on an alternative design concept, Low Altitude Demonstration System (LADS), and to demonstrate that concept on orbit in FY99-FY00.

(U) CB is currently being developed by Sandia National Laboratory, Albuquerque, NM, to explore the utility of staring, fastframing, multi-spectral electro-optical sensors for Theater Missile Defense (TMD), Technical Intelligence (TI), and Battlespace Characterization (BSC) missions. CB will fly on a classified host satellite.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603441F Space Based IR Arch (Dem/Val) (Space)
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	237,532	222,401	126,485	1,323,103
(U) Appropriated Value	249,151	217,401		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-5,793	-9,511		
b. SBIR	-5,826	-5,457		
c. Omnibus or Other Above Threshold Reprogram	19,045*			
d. Below Threshold Reprogramming	-3,700			
e. Rescission	-385			
(U) Adjustments to Budget Years Since FY 1998 PB			33,777	
(U) Current Budget Submit/FY 1999 President't Budget	252,492	202,433	160,262	1,432,558

(U) Change Summary Explanation:

Funding: *\$12,055K FY97 Omnibus reprogramming action processed but not yet reflected in funding database. Funds will be used for FDS cost growth. FY97 BTR to PE 64441F for Minature Sensor Technology Integration (MSTI) requirements.

\$1.41M FY98 additional inflation and SBIR reductions not yet reflected in funding database. \$20M FY98 Above Threshold Reprogramming request is to be submitted to Congress in early March 1998. Funds are required to maintain a SBIRS Low first launch in 2004.

FY99 increase funds FDS and LADS cost growths and on-orbit testing to validate SBIRS Low Capabilities.

Schedule: FDS and LADS launches changed from 3QFY99 to 1QFY00.

Technical: Environmental sensors on FDS and LADS eliminated

(U) C. Other Program Funding Summary (\$ in Thousands)

Not applicable

<u>Related RDT&E:</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY1999</u>	<u>FY2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) PE #604441F - SBIRS High EMD	193,018	316,467	538,438	564,239	395,905	269,798	143,059	102,566	2,801,661
(U) PE #305911F - DSP	24,668	20,689	12,037	7,595	7,587	4,462	4,760	0	1,941,972
(U) PE #604442F - SBIRS Low EMD	0	0	33,328	79,064	148,749	420,206	823,950	5,938,759	7,444,056

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BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603441F Space Based IR Arch (Dem/Val) (Space)							
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) SBIRS Low FDS Critical Design Review (CDR)	X											
(U) SBIRS Low FDS Launch (1QFY00)												
(U) SBIRS Low LADS PDR Initial Systems Design Integration				X								
(U) SBIRS Low LADS CDR Final Systems Design Integration					X							
(U) SBIRS Low LADS Launch (1QFY00)												
(U) Cobra Brass Launch (classified)												

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 4 - Demonstration and Validation			PE NUMBER AND TITLE 0603441F Space Based IR Arch (Dem/Val) (Space)					PROJECT 0007			
COST (In Thousands)			FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0007	SBIRS Low		241,493	199,677	160,262	154,133	115,398	0	0	0	1,397,992
Quantity of RDT&E Articles			0	0	0	3	0	0	0	0	3
<p>*\$12,055K FY97 Omnibus reprogramming action processed but not yet reflected in funding database. Funds will be used for FDS cost growth.</p> <p>(U) A. Mission Description and Budget Item Justification (U) SBIRS Low represents the Low Earth Orbit (LEO) component of the Space Based InfraRed System (SBIRS). The objective SBIRS LEO constellation of Low-earth orbiting satellites will provide global, below- and above-the-horizon access to strategic and tactical ballistic missiles in boost, post-boost, and midcourse phases of flight, and also track missile targets during reentry. LEO will support the four SBIRS mission areas: Missile Warning, Missile Defense, Technical Intelligence, and Battle Space Characterization.</p> <p>(U) Acquisition Strategy: (U) While SBIRS Low and Cobra Brass are part of the overall SBIRS, there are on-going contracts for each of these efforts. The GEO component of SBIRS is a pilot program for acquisition streamlining. The traditional Defense Acquisition Board (DAB) documentation for an ACAT ID program was consolidated into a Single Acquisition and Management Plan (SAMP) for the GEO component. The existing SBIRS Single Acquisition Management Plan (SAMP) will be updated to reflect the LEO component.</p> <p>(U) The SBIRS Low Flight Demonstration System (FDS) acquisition plan was approved in Aug 92. The developing organization for the SBIRS Low FDS satellites is the Air Force Space and Missile Center, Los Angeles AFB, CA. On 2 May 95, the FDS flyer contract was awarded to TRW, Redondo Beach, CA, to design and build two FDS satellites to launch in 1Q FY00. Boeing North America, formerly Rockwell International Space Systems Division, Downey, CA, was awarded an FDS non-flyer contract. On 3 Sep 96, Boeing North America, Downey, CA, was awarded a competitive Dem/Val contract to develop the Low Altitude Demonstration System (LADS).</p> <p>(U) The FDS Non-flyer contract with Boeing was terminated in Dec 1996 in favor of the competitive Dem/Val contract.</p> <p>(U) Program Definition Risk Reduction (PDRR) activities will begin in early FY99 with up to two Program Definition Risk Reduction study contracts. The purpose of Program Definition Risk Reduction is to develop specifications and designs for the SBIRS LEO EMD phase. This period will also be used to optimize the SBIRS HEO, GEO, LEO constellations and to revalidate the Air Force Space Command Operational Requirements Document. Pre-EMD contractors will compete for an EMD contract to be awarded in FY01. The same streamlined acquisition approach currently used for the GEO EMD will be used as a baseline for the LEO EMD. First launch of the operational LEO constellation will occur in FY04.</p> <p>(U) FY 1997 (\$ in Thousands)</p> <ul style="list-style-type: none"> - (U) \$ 133,193 Continue SBIRS Low FDS satellite and ground segment development. - (U) \$ 86,900 Low Altitude Demonstration System 											
Project 0007			Page 4 of 11 Pages				Exhibit R-2 (PE 0603441F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE		PROJECT	
4 - Demonstration and Validation	0603441F Space Based IR Arch (Dem/Val) (Space)		0007	
<ul style="list-style-type: none"> - (U) \$ 4,700 Technologies - (U) \$ 13,200 Program office activities. - (U) \$ 1,400 Space-Based Visible (SBV) - (U) \$ 2,100 Simulation, Discrimination and Computer Support - (U) \$241,493 Total 				
<u>(U) FY 1998 (\$ in Thousands)</u>				
<ul style="list-style-type: none"> - (U) \$ 102,036 Continue SBIRS Low FDS satellite and ground segment development - (U) \$ 68,154 Low Altitude Demonstration System - (U) \$ 6,700 Technologies - (U) \$ 5,900 Targets - (U) \$ 13,600 Program office activities. - (U) \$ 1,400 Simulation, Discrimination and Computer Support - (U) \$ 477 Funds will be transferred from BPAC 640007 to BPAC 640008 within PE 63441F for Cobra Brass ground station testing - (U) \$ 1,410 Pending reprogramming to higher priority AF requirements - (U) \$ 199,677 Total 				
<u>(U) FY 1999 (\$ in Thousands)</u>				
<ul style="list-style-type: none"> - (U) \$ 80,400 Continue SBIRS Low FDS satellite and ground segment development - (U) \$ 51,262 Low Altitude Demonstration System - (U) \$ 7,100 Technologies - (U) \$ 6,600 Targets - (U) \$ 13,500 Program office activities. - (U) \$ 1,400 Simulation, Discrimination and Computer Support - (U) \$160,262 Total 				
<u>(U) B. Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget/FY 1998 PB	230,747	219,441	126,485	1,292,547
(U) Appropriated Value	230,747	214,441		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions/adds		-9,415		
b. SBIR		-5,349		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY				PE NUMBER AND TITLE			PROJECT			
4 - Demonstration and Validation				0603441F Space Based IR Arch (Dem/Val) (Space)			0007			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>						
c. Omnibus or Other Above Threshold Reprogram	18,660*									
d. Below Threshold Reprogramming	-7,914									
e. Rescission										
(U) Adjustments to Budget Years Since FY 1998 PB			33,777							
(U) Current Budget Submit/ FY 1999 President's Budget	241,493	199,677	160,262	1,397,992						
(U) Change Summary Explanation:										
Funding: *\$12,055K FY97 Omnibus reprogramming action processed but not yet reflected in funding database.										
Funds will be used for FDS cost growth.FY97 \$3,700K to PE 64441F. \$4,214K transfered from BPAC 0007 to BPAC 0008 within this PE 63441F.										
In FY98, \$1.410M is pending reprogramming to fund higher priority AF requirements. In FY98, a \$20M Above Threshold Reprogramming is pending congressional approval.										
FY99 increase funds FDS and LADS cost growths and on-orbit testing to validate SBIRS-Low capabilities.										
Schedule: FDS and LADS launches changed from 3QFY99 to 1QFY00										
Technical: Environmental sensors on FDS and LADS eliminated.										
(U) C. Other Program Funding Summary (\$ in Thousands)										
Not Applicable										
Related RDT&E:	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY1999</u>	<u>FY2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>	
(U) PE #604441F - SBIRS High EMD	193,018	316,467	538,438	564,239	395,905	269,798	143,059	102,566	2,801,661	
(U) PE #305911F - DSP	24,668	20,689	12,037	7,595	7,587	4,462	4,760	0	1,941,972	
(U) PE #604442F - SBIRS Low EMD	0	0	33,328	79,064	148,749	420,206	823,950	5,938,759	7,444,056	
(U) D. Schedule Profile										
				<u>FY 1997</u>			<u>FY 1998</u>		<u>FY 1999</u>	
				1	2	3	4	1	2	3
(U) SBIRS Low FDS Critical Design Review (CDR)			X							
(U) SBIR Low FDS Launch (1QFY00)										
(U) LADS Initial Systems Design Integration						X				
(U) LADS Final Systems Design Integration							X			
(U) LADS Launch (1QFY00)										
Project 0007										
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Exhibit R-2 (PE 0603441F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603441F Space Based IR Arch (Dem/Val) (Space)			PROJECT 0007		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) FDS satellite and ground segment					133,193	102,036	80,400			
(U) Low Altitude Demonstration System (LADS)					86,900	68,154	51,262			
(U) Technologies					4,700	6,700	7,100			
(U) Targets						5,900	6,600			
(U) Program office activities					13,200	13,600	13,500			
(U) Space-Based Visible (SBV)					1,400					
(U) Simulation, Discrimination and Computer Support					2,100	1,400	1,400			
(U) Adjustments: (Pending Reprogramming)						1,887				
(U) Total					241,493	199,677	160,262			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government	Contract Method/Type	Award or Obligation Date	Performing Activity	Project Office	Total prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Activity</u>	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
<u>Product Development Organizations</u>										
FDS - TRW*	CPAF	May 95	706,488*	706,488*	341,863	133,193*	102,036	80,400	36,941	694,433*
LADS - Boeing	CPFF	Sep 96	234,127	234,127	15,000	86,900	68,154	51,262	12,811	234,127
Non-Flyer - RI	CPAF	May 95	130643	130643	130,643	0	0	0	0	130,643
Misc. Contracts	Various	Various	TBD	TBD	9,981	8,200	14,000	15,100	193,879	241,160
*\$12,055K FY97 Omnibus reprogramming action processed but not yet reflected in funding database. Funds will be used for FDS cost growth.										
<u>Support and Management Organizations</u>										
Aerospace		Various	N/A	N/A	16,307	8,400	8,900	8,800	18,000	60,407
SETA/SPO	Various	Various	N/A	N/A	13,235	4,800	4,700	4,700	7,900	35,335
Support										
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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603441F Space Based IR Arch (Dem/Val) (Space)				PROJECT 0007	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Test and Evaluation Organizations</u>										
Not Applicable					0	0	0	0	0	0
Government Furnished Property: Not Applicable.										
Subtotal Product Development					497,487	228,293	184,190	146,762	243,631	1,300,363
Subtotal Support and Management					29,542	13,200	13,600	13,500	25,900	95,742
Subtotal Test and Evaluation										
Adjustments: (Pending Reprogramming)							1,887			1,887
Total Project					527,029	241,493	199,677	160,262	269,531	1,397,992
Note: Where applicable, totals do not include funds previous to FY95 which all came from outside this PE										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603441F Space Based IR Arch (Dem/Val) (Space)				PROJECT 0008	
COST (In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0008 Cobra Brass	10,999	2,756	0	0	0	0	0	0	34,566
Quantity of RDT&E Articles	0	1*	0	0	0	0	0	0	0
<p>* RDT&E articles not seperately priced.</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u> (U) The Cobra Brass (CB) Program was a DIA/CMO (Central MASINT Office) Research and Development program to explore the utility of staring, fast framing, multi-spectral electro-optical sensors. CB was combined with the SBIRS program as a result of the Feb 95 Defense Acquisition Executive review. This approach is a significant departure from the traditional approach of scanning, slow framing, single band sensors previously used for Tactical Warning and Attack Assessment (TW/AA). (U) Previous CB sensors have demonstrated the ability of this technology to contribute to Theater Missile Defense (TMD), Technical Intelligence (TI), and Battlespace Characterization (BSC) missions. Major program emphasis is to increase the timeliness of sensor tasking and reporting. This will allow CB data to be processed in realtime through the existing theater infrastructure. CB will support the GEO and HEO component of the SBIRS.</p> <p>(U) <u>Acquisition Strategy</u> (U) The CB was transferred on 1 October 94 to the Air Force from DIA/CMO as part of risk mitigation for the baselined SBIRS program and was included into the SBIRS Low PDRR program element. Sandia National Laboratory (SNL) is the Air Force's executing agent for CB. The Air Force is responsible for funding CB through sensor and ground segment development and integration with the host satellite. Once on orbit, responsibility for funding, sensor operation, and data exploitation will be performed by other government agencies.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u> - (U) \$ 5,020 Payload - (U) \$ 1,636 Satellite Integration & Checkout - (U) \$ 4,343 Ground Station Build - (U) \$10,999 Total</p> <p>(U) <u>FY 1998 (\$ in Thousands):</u> - (U) \$1,856 Ground Station testing (Funds will be transferred from BPAC 640007 to BPAC 640008 within PE 63441F) - (U) \$ 900 Payload pre-flight testing and checkout integration onto spacecraft - (U) \$2,756 Total</p>									
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																																																																																													
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603441F Space Based IR Arch (Dem/Val) (Space)	PROJECT 0008																																																																																																																													
<p>(U) <u>FY 1999 (\$ in Thousands):</u> – (U) \$0 Not applicable</p> <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1997</th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1998</th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1999</th> <th style="text-align: center; border-bottom: 1px solid black;">Total Cost</th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget/FY 1998 PB</td> <td style="text-align: center;">6,785</td> <td style="text-align: center;">2,960</td> <td style="text-align: center;">0</td> <td style="text-align: center;">30,556</td> </tr> <tr> <td>(U) Appropriated Value</td> <td></td> <td style="text-align: center;">2,960</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Gen Reductions</td> <td></td> <td style="text-align: center;">-96</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td style="text-align: center;">-108</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: center;">4,214</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY98 PB</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">10,999</td> <td style="text-align: center;">2,756</td> <td style="text-align: center;">0</td> <td style="text-align: center;">34,566</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding FY97 \$300K Below Threshold Reprogramming from PE 0305911F, \$3.914 reallocation between projects to support increased CB requirements. Schedule: Not Applicable Technical: Not Applicable</p> <p>(U) <u>C. Other Program Funding Summary (\$ in Thousands):</u> Not Applicable</p> <p><u>Related RDT&E:</u> Not Applicable</p> <p>(U) <u>D. Schedule Profile</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;"></th> <th colspan="3" style="text-align: center; border-bottom: 1px solid black;">FY 1997</th> <th colspan="3" style="text-align: center; border-bottom: 1px solid black;">FY 1998</th> <th colspan="3" style="text-align: center; border-bottom: 1px solid black;">FY 1999</th> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> </tr> </thead> <tbody> <tr> <td>(U) Payload Consent to Ship Decision</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td>(U) Grd Station Build 1 Testing Complete at Sandia</td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Grd Station Build 1 Installed at Ground Site</td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) CB Launch</td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>Project 0008 Page 10 of 11 Pages Exhibit R-2 (PE 0603441F)</p>				FY 1997	FY 1998	FY 1999	Total Cost	(U) Previous President's Budget/FY 1998 PB	6,785	2,960	0	30,556	(U) Appropriated Value		2,960			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions		-96			b. SBIR		-108			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	4,214				(U) Adjustments to Budget Years Since FY98 PB					(U) Current Budget Submit/FY 1999 President's Budget	10,999	2,756	0	34,566		FY 1997			FY 1998			FY 1999				1	2	3	4	1	2	3	4	1	2	3	4	(U) Payload Consent to Ship Decision		X											(U) Grd Station Build 1 Testing Complete at Sandia				X									(U) Grd Station Build 1 Installed at Ground Site				X									(U) CB Launch					X							
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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603441F Space Based IR Arch (Dem/Val) (Space)				PROJECT 0008	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Payload					5,020	0	0			
(U) Ground Station Build					4,343	0	0			
(U) Satellite Integration and Checkout					1,636	0	0			
(U) Ground Station Testing					0	1,856	0			
(U) MIPR to National Air Intelligence Center					0	900	0			
(U) Total					10,999	2,756	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Sandia Nat'l Labs	Various	Various			20,811	10,999	2,756	0	0	34,566
<u>Support and Management Organizations</u>										
Not Applicable										
<u>Test and Evaluation Organizations</u>										
Not Applicable										
Government Furnished Property: Not Applicable										
Subtotal Product Development					20,811	10,999	2,756	0	0	34,566
Subtotal Support and Management										
Subtotal Test and Evaluation										
Project Total					20,811	10,999	2,756	0	0	34,566
Project 0008					Page 11 of 11 Pages			Exhibit R-3 (PE 0603441F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603617F Command Control & Communications Applications
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	3,992	7,232	7,770	7,975	8,049	8,166	8,319	Continuing	TBD
2314 Tactical Air Surveillance	1,014	762	448	458	461	465	472	Continuing	TBD
2317 Tactical Air Information Production & Distribution	530	2,648	3,080	3,156	3,184	3,233	3,294	Continuing	TBD
2321 Tactical Battle Information Management	2,198	3,693	4,037	4,136	4,175	4,228	4,307	Continuing	TBD
3804 Tactical Air Forces Systems Integration	250	129	205	225	229	240	246	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification:

This program is designed to rapidly transition development efforts in the science and technology base directly to warfighting commands. Projects are directly responsive to operational requirements for improved battle management, communications, theater missile defense (TMD), and surveillance capability. This program takes advantage of advanced technology developments throughout the services and industry as well as off-the-shelf technology. The program also defines system architectures and develops communications technology for modernization and improving the Air Force portion of the Tri-Service communications networks which the Defense Information Systems Agency (DISA) oversees. This program is in Category 4, Demonstration and Validation, because its products are primarily advanced development models, rapid prototype efforts, and software developed through evolutionary acquisition methods.

(U) Acquisition Strategy:

All major contracts within this Program were awarded after full open competition. (When restricted technologies are involved, foreign competition is not allowed.) Most contracts are of the cost plus fixed fee (CPFF) type, but when it is deemed appropriate by procurement officials, award fee contracts or firm-fixed price contracts are utilized.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation		PE NUMBER AND TITLE 0603617F Command Control & Communications Applications		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous Presidents Budget (FY 1998 PB)	4,179	7,650	7,926	TBD
(U) Appropriated Value	4,378	7,650		
(U) Adjustments to Appropriated Value				
a. Congressional Reductions	-114	-273		
b. Small Business Innovative Research	-85	-145		
c. Omnibus/Other Above Threshold Reprogramming				
d. Below Threshold Reprogramming	-180			
e. Rescissions	-7			
(U) Adjustments to Budget Years Since FY 1998 PB			-156	
(U) Current Budget Submit/FY 1999 President's Budget	3,992	7,232	7,770	TBD
 (U) Change Summary Explanation:				
Funding: See individual projects.				
Schedule: N/A				
Technical: N/A				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> - See individual projects.				
 (U) D. <u>Schedule Profile</u> - See individual projects.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603617F Command Control & Communications Applications				PROJECT 2314			
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2314 Tactical Air Surveillance		1,014	762	448	458	461	465	472	Continuing	TBD	
Quantity of RDT&E Articles		0	0	0	0	0	0	0	0	0	
<p>(U) A. <u>Mission Description and Budget Item Justification</u> Develops advanced technology and demonstrates equipment improvements to the Theater Air Control System (TACS) ground surveillance radars. Investigates non-radar and/or adjunct radar sensors to address the Combat Air Forces (CAF) surveillance, detection, and tracking requirements not satisfied by an active radar. Develops advanced surveillance technology in support of next generation sensors and sensor signal processing.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 499 Completed tube based transmitter panel for AN/TPS-75. - (U) \$ 515 Initiated waveform and signal processor design and evaluation. - (U) \$1,014 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 90 Initiate Track Before Detect for Theater Missile Defense (TMD) with adaptive elevation angle estimation - (U) \$ 103 Initiate and complete Mode S integration study for AN/TPS-75 Radar Set - (U) \$ 75 Initiate and complete analysis of solid state versus tube based transmitter for AN/TPS-75 Radar Set - (U) \$ 494 Complete waveform and signal processor design and evaluation - (U) \$ 762 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 448 Continue Track Before Detect for TMD - (U) \$ 448 Total 											
Project 2314			Page 3 of 22 Pages				Exhibit R-2 (PE 0603617F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE						PROJECT		
4 - Demonstration and Validation	0603617F Command Control & Communications Applications						2314		
 (U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 1999</u>	<u>FY 1999</u>	<u>FY 1999</u>	<u>Total</u>		
							<u>Cost</u>		
(U) Previous Presidents Budget (FY 1998 PB)	1,014	803		457			TBD		
(U) Appropriated Value	1,057	803							
(U) Adjustments to Appropriated Value									
a. Congressional Reductions	-22	-26							
b. Small Business Innovative Research	-21	-15							
c. Omnibus/Other Above Threshold Reprogramming									
d. Below Threshold Reprogramming									
e. Rescissions									
(U) Adjustments to Budget Years Since FY 1998 PB				-9					
(U) Current Budget Submit/FY 1999 President's Budget	1,014	762		448			TBD		
 (U) Change Summary Explanation:									
Funding: N/A									
Schedule: N/A									
Technical: N/A									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands):</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) RDT&E, AF (0602204F, Project 2002)	8,775	10,046	9,529	9,314	10,863	10,344	10,598	Cont	TBD
(U) RDT&E, AF (0603789F, Project 4072)	6,114	6,841	6,941	7,146	7,917	7,846	8,051	Cont	TBD
(U) RDT&E, AF (0207412)	589	393	440	487	471	460	451	Cont	TBD
(U) Other Procurement, AF (0207412)	9,947	28,178	26,782	24,973	19,860	20,845	20,925	Cont	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603617F Command Control & Communications Applications						PROJECT 2314	
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U)	Tube-based transmitter development			X								
(U)	Tube-based transmitter panel performance and R&M testing				*	X						
(U)	Tube-based versus solid-state eval				*	X						
(U)	Develop waveform signal processor						*	X				
(U)	Integrate Mode S into AN/TPS-75					*	X					
(U)	Track Before Detect for TMD					*						=>
* Indicates the start of an activity; X indicates the completion.												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY				PE NUMBER AND TITLE				PROJECT		
4 - Demonstration and Validation				0603617F Command Control & Communications Applications				2314		
 (U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Primary Hardware Development				899	644	329				
(U) Government Engineering Support				100	103	104				
(U) Travel				15	15	15				
(U) Total				1,014	762	448				
 (U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Hughes	C/CPFF	June 95	1,383	1,383	1,179	204	0	0	0	1,383
DSA	Tsk Ord'r Agmt	Apr 97	905	905	0	470	403	0	0	905
TBD (TMD)	Tsk Ord'r Agmt	Apr 98	TBD	1,258	0	0	80	338	840	1,258
<u>Support and Management Organizations</u>										
Rome Laboratory	In-house	N/A	n/a	n/a	6,419	190	194	110	Continuing	TBD
Miscellaneous	Various	Various	n/a	n/a	0	150	85	0	Continuing	TBD
<u>Test and Evaluation Organizations</u> - Not Applicable.										
Government Furnished Property: Not Applicable.										
Project 2314				Page 6 of 22 Pages				Exhibit R-3 (PE 0603617F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603617F Command Control & Communications Applications	PROJECT 2314

(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

	<u>Total</u> <u>Prior to</u> <u>FY 1997</u>	<u>Budget</u> <u>FY 1997</u>	<u>Budget</u> <u>FY 1998</u>	<u>Budget</u> <u>FY 1999</u>	<u>Budget to</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Subtotal Product Development	1,179	674	483	338	840	3,514
Subtotal Support and Management	6,419	340	279	110	Cont.	TBD
Subtotal Test and Evaluation	0	0	0	0	Cont.	TBD
Total Project	7,598	1,014	762	448	Cont.	TBD

DATE
February 1998

BUDGET ACTIVITY
4 - Demonstration and Validation

PE NUMBER AND TITLE
0603617F Command Control & Communications Applications

COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2317 Tactical Air Information Production & Distribution	530	2,648	3,080	3,156	3,184	3,233	3,294	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** Transitions advanced communications to the Theater Deployable Communications (TDC) program in support of Theater Battle Management (TBM) command and control enhancements. The goal is to reduce the risk of transitioning advanced government or commercial off-the-shelf technology into military communications systems. Capabilities developed include modular programmable radio technologies and improvements to survivability, deployability, interoperability, and control of communications networks. The SPEAKeasy program core technologies and concept were demonstrated and transitioned to support the Joint Tactical Radio System (JTRS) JPO acquisition activities. This project will continue to develop and transition risk-reduced capabilities to airborne platforms required for these airborne platforms to effectively host the JTRS. Unmanned Airborne Vehicles (UAV)/Advanced Communications Node (ACN) platforms are intended to be the first so equipped, followed by other wider body aerospace platforms.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 500 Completed SSCN Phase II/Conduct Joint Demonstration.
- (U) \$ 30 Planned airborne-transportable radio development.
- (U) \$ **530 Total**

(U) FY 1998 (\$ in Thousands):

- (U) \$ 200 Extend SSCN capability to demonstrate capability in a rapid deployment scenario (SOCOM).
- (U) \$ 608 Initiate airborne-transportable radio wideband/multi-band antenna development.
- (U) \$1,000 Initiate airborne-transportable radio electromagnetic interference/compatibility research and test.
- (U) \$ 840 Initiate airborne-transportable radio wideband power amplifier development.
- (U) \$2,648 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$ 942 Continue airborne-transportable radio wideband/multi-band antenna development.
- (U) \$1,100 Continue airborne-transportable radio electromagnetic interference/compatibility research and test.
- (U) \$1,038 Continue airborne-transportable radio wideband power amplifier development.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE						PROJECT		
4 - Demonstration and Validation	0603617F Command Control & Communications Applications						2317		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>					Total	
								<u>Cost</u>	
(U) Previous Presidents Budget (FY 1998 PB)	530	2,808	3,142					TBD	
(U) Appropriated Value	569	2,808							
(U) Adjustments to Appropriated Value									
a. Congressional Reductions	-28	-107							
b. Small Business Innovative Research	-11	-53							
c. Omnibus/Other Above Threshold Reprogramming									
d. Below Threshold Reprogramming									
e. Rescissions									
(U) Adjustments to Budget Years Since FY 1998 PB				-62					
(U) Current Budget Submit/FY 1999 President's Budget	530	2,648	3,080					TBD	
 (U) Change Summary Explanation:									
Funding: N/A									
Schedule: N/A									
Technical: N/A									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands):</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To	Total
								<u>Compl</u>	<u>Cost</u>
(U) RDT&E, AF (0602702F, Project 4519)	12,286	11,550	12,455	10,861	12,389	111,959	12,260	Cont	TBD
(U) RDT&E, AF (0603789F, Project 2335)	4,121	4,636	4,119	4,269	5,414	5,363	5,511	Cont	TBD
(U) RDT&E, AF (0603789F, Project 4216)	0	1,420	2,441	2,564	2,768	2,834	2,919	Cont	TBD
(U) RDT&E, AF (0603238F, Project 4216)	2,187	0	0	0	0	0	0	0	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603617F Command Control & Communications Applications	PROJECT 2317
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				
	1	2	3	1	2	3	4	1	2	3	4
(U) Secure Survivable Comm Net Phase II											
- Transition Plan				X							
- Development				X							
- Joint Demonstration				*				X			
- Demo for rapid deployment				*				X			
(U) Airborne-transportable Radio System Development											
- Planning				*	X						
- Antenna Development (Multiple Contracts)					*				X		
- Electro-magnetic Interference and Compatability Research/Tests (Multiple Contracts)						*		X			
- Wideband power amplifier development					*						

* Indicates the start of an activity; X indicates the completion.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603617F Command Control & Communications Applications			PROJECT 2317		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Primary Hardware Development				190	2,348	2,780			
(U)	Government Engineering Support				50	60	60			
(U)	Travel				40	40	40			
(U)	Contractor Engineering Support				250	200	200			
(U)	Total				530	2,648	3,080			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
ESC	PD	Various	1,040	1,040	210	230	200	200	200	1,040
SOCOM	PD	Sept 96	592	592	392	0	200	0	0	592
TBD (Airborne-transportable radio support)	TBD	TBD	TBD	TBD	0	0	1,948	2,580	Cont.	TBD
<u>Support and Management Organizations</u>										
Rome Laboratory	In-house	n/a	n/a	TBD	12,153	139	300	300	Cont.	TBD
Miscellaneous	Various	Various	n/a	TBD	Cont.	161	0	0	Cont.	TBD
<u>Test and Evaluation Organizations</u> - Not Applicable										
Project 2317					Page 11 of 22 Pages			Exhibit R-3 (PE 0603617F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)					DATE February 1998	
BUDGET ACTIVITY	PE NUMBER AND TITLE				PROJECT	
4 - Demonstration and Validation	0603617F Command Control & Communications Applications				2317	
Government Furnished Property: Not Applicable						
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>						
	<u>Total</u>					
	<u>Prior to</u>	<u>Budget</u>	<u>Budget</u>	<u>Budget</u>	<u>Budget to</u>	<u>Total</u>
	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
Subtotal Product Development	602	230	2,348	2,780	Cont.	TBD
Subtotal Support and Management	12,153	300	300	300	Cont.	TBD
Subtotal Test and Evaluation	0	0	0	0	Cont.	TBD
Total Project	12,755	530	2,648	3,080	Cont.	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603617F Command Control & Communications Applications				PROJECT 2321				
<i>COST (\$ In Thousands)</i>				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2321 Tactical Battle Information Management				2,198	3,693	4,037	4,136	4,175	4,228	4,307	Continuing	TBD
Quantity of RDT&E Articles				0	0	0	0	0	0	0	0	0
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Designs and integrates improvements to system software and C3 applications modules via rapid prototyping and maximum user participation in all design activities. Current focus is the functional development and rapid prototyping of the Force Level Execution (FLEX) system, which will assist the combat operations personnel in an AOC to quickly replan or reallocate resources based on real-time threat inputs, including time critical targets (TCTs) and changes in the wartime scenario. The Joint Defensive Planner system will provide an automated system that aids the air defense duty officers in planning the integrated employment of Defensive Counter-Air and Active and Passive Defenses in conjunction with Offensive Counter-Air, to destroy or neutralize enemy aircraft and theater missiles. (The Joint Defensive Planner (JDP) was previously named the Defensive Planning and Execution (DPE) system. The change was made due to the decision by the Joint Standards Air Operations Software Configuration Control Board to make the Defensive Planning and Execution system the joint software application for theater air and missile defensive planning and monitoring.)</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,433 Continued FLEX development and initiate integration into TBM Core Systems. - (U) \$ 640 Initiated accelerated Joint Defensive Planner software development for joint use. - (U) \$ 125 Completed TBM systems integration evaluations. - (U) \$2,198 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,435 Complete initial FLEX integration into TBMCS V1.0 and TBMCS remote terminals. - (U) \$1,169 Continue Joint Defensive Planner software development - (U) \$ 89 Demonstrate FLEX airborne capabilities via TBMCS remote terminals (i.e. AWACS, JSTARS, ABCCC). - (U) \$3,693 Total 												
Project 2321				Page 13 of 22 Pages				Exhibit R-2 (PE 0603617F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																																																															
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603617F Command Control & Communications Applications	PROJECT 2321																																																																																															
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 814 Assess FLEX airborne application for integration into TBMCS remote terminals for airborne use. - (U) \$3,223 Initiate integration of Joint Defensive Planner as a TBMCS application. - (U) \$4,037 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: right; width: 10%;"><u>FY 1997</u></th> <th style="text-align: right; width: 10%;"><u>FY 1998</u></th> <th style="text-align: right; width: 10%;"><u>FY 1999</u></th> <th style="text-align: right; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous Presidents Budget (FY 1998 PB)</td> <td style="text-align: right;">2,385</td> <td style="text-align: right;">3,894</td> <td style="text-align: right;">4,118</td> <td style="text-align: right;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">2,485</td> <td style="text-align: right;">3,894</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. 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Rescissions</td> <td style="text-align: right;">-7</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-81</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">2,198</td> <td style="text-align: right;">3,693</td> <td style="text-align: right;">4,037</td> <td style="text-align: right;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: FY97 BTR to PE 0305176F to support Combat Survivor Evader Locator requirement.</p> <p style="padding-left: 40px;">Schedule: N/A</p> <p style="padding-left: 40px;">Technical: N/A</p> <p>(U) <u>C. Other Program Funding Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="text-align: right; width: 5%;"><u>FY 1997</u></th> <th style="text-align: right; width: 5%;"><u>FY 1998</u></th> <th style="text-align: right; width: 5%;"><u>FY 1999</u></th> <th style="text-align: right; width: 5%;"><u>FY 2000</u></th> <th style="text-align: right; width: 5%;"><u>FY 2001</u></th> <th style="text-align: right; width: 5%;"><u>FY 2002</u></th> <th style="text-align: right; width: 5%;"><u>FY 2003</u></th> <th style="text-align: right; width: 5%;"><u>ToCompl</u></th> <th style="text-align: right; width: 5%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) RDT&E, AF (0603789F, Project 2335)</td> <td style="text-align: right;">4,121</td> <td style="text-align: right;">4,636</td> <td style="text-align: right;">4,119</td> <td style="text-align: right;">4,269</td> <td style="text-align: right;">5,414</td> <td style="text-align: right;">5,363</td> <td style="text-align: right;">5,511</td> <td style="text-align: right;">Cont</td> <td style="text-align: right;">TBD</td> </tr> <tr> <td>(U) RDT&E, AF (0207438F, Project 4287)</td> <td style="text-align: right;">23,916</td> <td style="text-align: right;">12,886</td> <td style="text-align: right;">9,222</td> <td style="text-align: right;">8,693</td> <td style="text-align: right;">6,733</td> <td style="text-align: right;">11,332</td> <td style="text-align: right;">11,879</td> <td style="text-align: right;">Cont</td> <td style="text-align: right;">TBD</td> </tr> <tr> <td>(U) RDT&E, AF (0603827C, Project 3261)</td> <td style="text-align: right;">0</td> <td style="text-align: right;">528</td> <td style="text-align: right;">282</td> <td style="text-align: right;">281</td> <td style="text-align: right;">37</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> <td></td> <td></td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous Presidents Budget (FY 1998 PB)	2,385	3,894	4,118	TBD	(U) Appropriated Value	2,485	3,894			(U) Adjustments to Appropriated Value					a. Congressional Reductions	-52	-127			b. Small Business Innovative Research	-48	-74			c. Omnibus/Other Above Threshold Reprogramming					d. Below Threshold Reprogramming	-180				e. Rescissions	-7				(U) Adjustments to Budget Years Since FY 1998 PB			-81		(U) Current Budget Submit/FY 1999 President's Budget	2,198	3,693	4,037	TBD		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>ToCompl</u>	<u>Total Cost</u>	(U) RDT&E, AF (0603789F, Project 2335)	4,121	4,636	4,119	4,269	5,414	5,363	5,511	Cont	TBD	(U) RDT&E, AF (0207438F, Project 4287)	23,916	12,886	9,222	8,693	6,733	11,332	11,879	Cont	TBD	(U) RDT&E, AF (0603827C, Project 3261)	0	528	282	281	37	0	0		
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Project 2321	Page 14 of 22 Pages	Exhibit R-2 (PE 0603617F)																																																																																															

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)										DATE February 1998		
BUDGET ACTIVITY					PE NUMBER AND TITLE					PROJECT		
4 - Demonstration and Validation					0603617F Command Control & Communications Applications					2321		
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) TBM Systems Integration Evaluation		X										
(U) FLEX												
- TBMCS V1.0 integration						X						
- Airborne application					*							
(U) Joint Defensive Planner software development			*									
- Evolutionary Prototype (EP) #1						X						
- EP #2								X				
- EP #3									X			
- Advanced Technology Demonstration										X		
- Functional Validation Model #1											X	
- Initial integration into TBMCS												*
(U) Sensor Management Development (2Q00)												
* Indicates the start of an activity; X indicates the completion.												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY					PE NUMBER AND TITLE				PROJECT	
4 - Demonstration and Validation					0603617F Command Control & Communications Applications				2321	
 (U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Software Development					1,573	2,958	3,337			
(U) Government Engineering Support					250	310	200			
(U) Travel					150	150	200			
(U) Contractor Engineering Support					225	275	300			
(U) Total					2,198	3,693	4,037			
 (U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Logicon	C/CPFF	June 94	8,439	8,439	6,033	631	1,775	0	0	8,439
PRB Assoc.	C/CPAF	Feb 97	7,600	7,600	0	650	750	2,600	3,600	7,600
TBD (Sensor Mgmt)	TBD	Apr 00	TBD	7,100	0	0	0	0	7,100	7,100
<u>Support and Management Organizations</u>										
Rome Laboratory	In-house	n/a	n/a	TBD	27,423	604	754	944	Cont	TBD
Miscellaneous	Various	Various	n/a	TBD	0	313	414	493	Cont	TBD
<u>Test and Evaluation Organizations</u> - Not Applicable										
Project 2321					Page 16 of 22 Pages			Exhibit R-3 (PE 0603617F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603617F Command Control & Communications Applications	PROJECT 2321

(U) **B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)**

Government Furnished Property: Not Applicable

	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development	6,033	1,281	2,525	2,600	10,700	23,139
Subtotal Support and Management	27,423	917	1,168	1,437	Cont	TBD
Subtotal Test and Evaluation	0	0	0	0	Cont	TBD
Total Project	33,456	2,198	3,693	4,037	Cont	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603617F Command Control & Communications Applications				PROJECT 3804		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
3804 Tactical Air Forces Systems Integration	250	129	205	225	229	240	246	Continuing	TBD	
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Provides systems engineering and integration support to the Combat Air Forces (CAF) or to other development efforts. Project addresses integration and interoperability issues associated with TBM General Officers Steering Group (GOSG) directed efforts, makes recommendations, identifies deficiencies, and establishes requirements for development efforts.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 100 Prepared for AOC Defensive Planning Development. - (U) \$ 150 Completed Sensor Management analysis. - (U) \$ 250 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 75 Support and Analyze TBMCS Theater Integration - (U) \$ 54 Evaluate Joint Defensive Planner Prototype - (U) \$ 129 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 105 Evaluate Joint Defensive Planner advanced technology demonstration prototype - (U) \$ 100 Initiate transition of Joint Defensive Planner System to TBMCS - (U) \$ 205 Total 										
Project 3804			Page 18 of 22 Pages				Exhibit R-2 (PE 0603617F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603617F Command Control & Communications Applications		PROJECT 3804	
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous Presidents Budget (FY 1998 PB)	250	145	209	TBD
(U) Appropriated Value	267	145		
(U) Adjustments to Appropriated Value				
a. Congressional Reductions	-12	-13		
b. Small Business Innovative Research	-5	-3		
c. Omnibus/Other Above Threshold Reprogramming				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-4	
(U) Current Budget Submit/FY 1999 President's Budget	250	129	205	TBD
(U) Change Summary Explanation:				
Funding: N/A				
Schedule: N/A				
Technical: N/A				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>: Not Applicable.				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603617F Command Control & Communications Applications						PROJECT 3804	
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Analysis of TBM Core Systems theater integration	X											
(U) Sensor Management Analysis		*		X								
(U) Defensive Planning and Execution - Develop Plan		*		X								
(U) TBM Force Level System prototype Evaluations												
- AOC Combat Operations	X											
- Joint Operations	*				X							
- TBMCS Integration					*		X					
(U) Joint Defensive Planner Evaluation/ Integration into TBMCS												
- Evaluate JDP Prototype							*				X	
- Transition to TBMCS											*	
* Indicates the start of an activity; X indicates the completion.												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY					PE NUMBER AND TITLE				PROJECT	
4 - Demonstration and Validation					0603617F Command Control & Communications Applications				3804	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Systems Engineering					189	120	180			
(U) Government Engineering Support					11	9	25			
(U) Contractor Engineering Support					50	0	0			
(U) Total					250	129	205			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations - Not Applicable.</u>										
<u>Support and Management Organizations</u>										
MITRE	SS/TO&P	Various	n/a	TBD	2138	189	120	180	Continuing	TBD
Rome Laboratory	In-house	n/a	n/a	TBD	132	11	9	25	Continuing	TBD
Miscellaneous	Various	Various	n/a	TBD	Cont.	50	0	0	Continuing	TBD
<u>Test and Evaluation Organizations - Not Applicable.</u>										
Government Furnished Property: Not Applicable.										
Project 3804					Page 21 of 22 Pages			Exhibit R-3 (PE 0603617F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603617F Command Control & Communications Applications	PROJECT 3804

(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

	<u>Total</u> <u>Prior to</u> <u>FY 1997</u>	<u>Budget</u> <u>FY 1997</u>	<u>Budget</u> <u>FY 1998</u>	<u>Budget</u> <u>FY 1999</u>	<u>Budget to</u> <u>Complete</u>	<u>Total</u> <u>Program</u>
Subtotal Product Development	0	0	0	0	Continuing	TBD
Subtotal Support and Management	2270	250	129	205	Continuing	TBD
Subtotal Test and Evaluation	0	0	0	0	Continuing	TBD
Total Project	2270	250	129	205	Continuing	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603742F Combat Identification Technology	PROJECT 2597
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2597 Noncooperative Identification Subsystems	1,936	1,276	6,177	6,428	6,491	6,578	6,754	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* Classified information can be provided upon request.

(U) A. Mission Description and Budget Item Justification

(U) U.S. Combat Air Forces have a critical requirement to positively identify enemy, friendly, and neutral aircraft and battlefield equipment. Timely and reliable Combat Identification (CID) reduces fratricide, and enables the battlefield commander to effectively manage and control the battle. Such consequences have fostered the following operational requirements for CID systems:

- High confidence of ID
- High probability of ID (friend, foe, and neutral)
- All weather capable
- Day/night capable
- Worldwide operations capable

This program is in budget activity 4 - The PE includes advanced technology demonstrations that help transition technologies from laboratory to operational use.

(U) Acquisition Strategy: The Combat ID Technologies program element develops, demonstrates, and transitions promising target identification technologies to meet the requirements cited above. Project 2597 funds the Ultra-High Range Resolution (UHRR) radar; a Non-Cooperative Target Recognition (NCTR) technique code named HAVE CENTAUR. The HAVE CENTAUR program development was awarded under a competitive bid process. Additionally, Project 2597 will focus on developing and demonstrating the most promising Air-to-Ground Combat ID techniques. Future Air-to-Ground CID technology developments will be contracted for under a competitive Request For Proposal (RFP) process. Current and planned accomplishments by fiscal year are as follows:

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603742F Combat Identification Technology	PROJECT 2597
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,280 Continued UHRR ground-to-air ID classifier testing and began air-to-air testing on the aircraft testbed - (U) \$133 Funded an Air-to-Air Correlation Accuracy requirements study - (U) \$523 Funded CID Integrated Management Team for overall management of Air Force CID programs. Supports related studies/demos to increase warfighters CID capabilities and funded Air Traffic Control Radar Beacon System/Identification Friend or Foe (IFF)/ Mark XII System Program Office (AIMSPO) support of potential next generation IFF equipment integration with current IFF capabilities. - (U) \$1,936 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$200 Conduct HAVE CENTAUR algorithm validation and data analysis, continue synthetic target database development and provide test support. - (U) \$300 Air-to-Ground (A/G) CID study – Define and quantify A/G CID requirements. Establish CID systems needed in multiple mission areas. - (U) \$150 Funds work on Identification Data Combining Process (IDCP) algorithm and program to set up a NATO standard for correlating and fusing identification data onboard AWACS aircraft. - (U) \$626 Funds CID Integrated Management Team for management of Air Force CID programs and conducting related studies/demos to increase warfighter’s CID capabilities. Also funds AIMSPO support of next generation IFF equipment integration with current IFF capabilities. - (U) \$1,276 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,200 Conduct HAVE CENTAUR algorithm validation, continue synthetic target database development, and provide test support. - (U) \$1,200 Continue development and demonstration planning of most promising air-to-ground identification techniques for reduced battlefield fratricide and enhanced mission performance. - (U) \$800 Investigate cruise missile target ID techniques to counter the emerging cruise missile threat - (U) \$350 Air-to-Ground (A/G) CID study. Analyze selected systems to determine mission effectiveness and optimal A/G CID system architecture. - (U) \$627 Funds CID Integrated Management Team for overall management of Air Force CID programs. Supports related studies/demos to increase warfighter’s CID capabilities and funds AIMSPO support of next generation IFF equipment integration with current IFF capabilities - (U) \$6177 Total 		
Project 2597	Page 2 of 6 Pages	Exhibit R-2 (PE 0603742F)

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603742F Combat Identification Technology	PROJECT 2597
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(U) D. Schedule Profile: Item 2 of the schedule reflects the SPO radar schedule, other categories refer to Have Centaur

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
1. (U) H/W EMD/Production (Radar)												
EMD (Start 1QFY95)									X			
Flight Test			*					X				
LRIP & Production Begins										X		
2. (U) Classifier Dev/Qual												
Ground-to-Air Test #2 (Complete)		*										
Airborne Data Collection			*		X							
Classifier/Target Library								X				
Flight Demo					X			X				
3. (U) Radar Software Upgrade Build			*									
4. (U) Other: H/W EMD complete: 1QFY00												
LRIP start: 2QFY99 Finish: 2QFY00												
Production Complete: 4QFY04												
OFP PDR								X				
OFP CDR										X		

* denotes completed events

X denotes planned events

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603742F Combat Identification Technology				PROJECT 2597		
(U) A. <u>Project Cost Breakdown (\$ in Thousands):</u>										
				FY 1997	FY 1998	FY 1999				
Product Development				1834	1276	4527				
Support and Management				0	0	1000				
Test and Evaluation				102	0	650				
Total				1936	1276	6177				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands):</u>										
Performing Organizations:										
Contractor or Government	Contract									
Performing <u>Activity</u>	Method/Type	Award or	Performing	Project	Total			Budget	Budget to	Total
	or Funding	Obligation	Activity	Office	Prior to			FY 1999	Complete	Program
	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>			
<u>Product Development Organizations</u>										
Hughes A/C Co	CPFF	Sep 92	35529	35529	30354	125		1400	2900	34779
Westinghouse Elec Co	CPFF	Aug 93	1780	1780	1780					1780
McDonnell Douglas	AF616	Aug 94	3550	3550	2750	800				3550
Veda, Inc.	CPFF	Aug 94	12811	12811	12059	162	370	320		12911
National Air Intel Center	AF616	Annually	3329	3329	3329					3329
USAF Wright Laboratory		N/A	3260	3260	2077	255	50	150	700	3232
Combat ID IMT Studies	AF616/ AF185	Various				133	300	2345	Continue	TBD
Project 2597										
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Exhibit R-3 (PE 0603742F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603742F Combat Identification Technology				PROJECT 2597	
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Support and Management Organizations</u>										
Georgia Tech Research Institute (GTRI)	CPFF	Aug 94	1978	1978	1978	0	0	0	0	1978
Demeco, Inc.	CPFF	Aug 94	9004	9004	6604	0	0	1000	1400	9004
USAF Combat ID IMT		N/A				359	556	312	Continue	TBD
<u>Test and Evaluation Organizations</u>										
3246 th Test Wing, Eglin AFB, FL	Mixed, CPF, MIPRS	N/A	3769	3769	2217	102	0	650	800	3769
544 th Range Group, Nellis AFB, NV										
Government Furnished Equipment: None										
Subtotal Product Development					52349	1475	720	4215	Continue	TBD
Subtotal Support and Management Organizations					8582	359	556	1312	Continue	TBD
Subtotal Test and Evaluation Organizations					2217	102	0	650	800	3769
Total Project					63148	1936	1276	6177	Continue	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development	PROJECT NATO
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
NATO Nato Coop R&D	9,767	10,414	11,117	11,291	11,913	12,026	12,255	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

***This program element was previously funded under OSD PE 0603790D which will be used to fund DoD-wide priority agreements. FY97 is the first year of funding for PE 0603790F.**

(U) A. Mission Description and Budget Item Justification

These funds will be used to help implement international cooperative research, development, and acquisition (ICRD&A) agreements with NATO and major non-NATO allies (Australia, Egypt, Israel, Japan, and Korea). The program implements the provisions of Title 10 U.S. Code, Section 2350a on NATO Cooperative Research and Development (R&D). The program was established to improve what Congress perceived as inadequate cooperation among NATO nations, and later major non-NATO allies, in research, development, and production. The legislation authorized funds to significantly improve US and allied conventional defense capabilities by leveraging the world's best defense technologies, eliminating costly duplication of research and development efforts, accelerating the availability of defense systems, and promoting US and allied interoperability or commonality. These funds will help implement Air Force agreements that directly support the Air Force and DoD Science and Technology community, Major Commands, Joint Vision 2010, and the Air Force's Strategy of Global Engagement. The planned program is shown below. The final program will be reported separately as required by Title 10 U.S. Code, Section 2350a(f). This program element funds the implementation of Air Force ICRD&A agreements in (1) Basic Research (2) Applied Research (3) Advanced Technology Development (4) Demonstration and Validation (5) Engineering and Manufacturing Development and (6) RDT&E Management Support. This PE is designated in Budget Activity 4 because most of the ICRD&A projects support specific systems, include all efforts necessary to evaluate integrated technologies in as realistic an operating environment as possible to assess the performance or cost reduction potential of advanced technology and help expedite technology transition from the laboratory to operational use.

(U) Acquisition Strategy:

A principal goal of the NATO Cooperative R&D program is to effectively utilize the aggregate resources invested by the US and our allies in conventional defense R&D. This program element provides the critical funding incentive needed to pursue ICRD&A agreements and helps to (a) leverage USAF and allied resources through cost sharing and economies of scale; (b) exploit the best US and allied technologies for equipping coalition forces; (c) demonstrate areas of commonality or interoperability with our allies; and (d) accelerate the availability of defense technology and systems. Candidate projects are reviewed and approved by the USD(A&T). An international agreement defining project objectives, responsibilities and costs is required prior to release of funds. To obtain these funds and ensure service commitment, projects are selected from existing or new RDT&E programs funded in the Future Years Defense Plan (FYDP). Project offices must show matching funds and contributions from associated program elements and equitable allied funding. As appropriate, funding responsibility for out-year requirements and follow-on efforts are transferred to the project office and associated program elements. Most contracts are awarded after full and open competition.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0603790F NATO Cooperative Research and Development	NATO
<p>(U) <u>FY 1997 (\$ in Thousands)</u>: Funds were allocated for continuing projects initiated in FY95 and FY96 under PE 0603790D and new projects.</p> <p>(U) <u>Continuing Projects Initiated in FY95 and FY96 Under PE 0603790D</u>:</p> <ul style="list-style-type: none"> - (U) \$475 Image Information Reformatter (IIR) (Rome Laboratory/France) - Cooperative project to define, develop and demonstrate an Advanced Development Model (ADM) - IIR for the purpose of demonstrating interoperability among allied tactical imagery reconnaissance collection and ground systems. In FY97 phase one definition activities were completed and a phase two program to build and demonstrate the ADM-IIR was defined. - (U) \$2,700 Experimental Air Operations Center (EAOC) (Electronics Systems Center/United Kingdom) - Cooperative research and advanced development project into an EAOC using the US Contingency Theater Automated Planning System (CTAPS) as a baseline. In FY97 the project conducted research and advanced development into key command and control (C2) areas of Combined Air Operations Center (CAOC) functionality: the US developed an Enhanced Monitoring and Execution tool and conducted studies on Enhanced Human Computer Interfaces (HCI); the US and United Kingdom jointly developed a Battle Space Display (BSpD); and the United Kingdom provided a Master Battle Planning (MBP) tool and War Gaming/Exercise support. The MBP component was well received at the Kenney Battle Lab Initiative and was selected to participate in EFX-98. Anticipate completing development of this module and fielding in Theater Battle Management Core Systems (TBMCS) version 1.1. - (U) \$2,742 Vista Warrior (Armstrong Laboratory/United Kingdom) - Cooperative project to develop and evaluate advanced helmet-mounted tracker and display (HMT/D) technologies, multi-sensory virtual interface concepts, and virtual display and control devices for incorporation into advanced aircraft. In FY97 the project demonstrated the monocular Helmet-Vehicle Interface (HVI), and the corresponding improvements in reliability, safety and commonality, with an advanced HMT/D in an F-15C; evaluated alternative control and display technologies for use in advanced cockpits; initiated assessment of the utility of color symbology for HMT/Ds in the US Synthesized Immersion Research Environment (SIRE) facility; conducted risk reduction studies on eye tracker technologies; and developed method to perform a quick look assessment of biodynamic inference suppression algorithm for the Joint Helmet-Mounted Cueing System Engineering and Manufacturing Development program. - (U) \$800 Effects of the Ionosphere on Command, Control, Communications, and Intelligence (C3I) Systems (Phillips Laboratory/United Kingdom) - Cooperative project to leverage complementary ionospheric sensors and data to develop capabilities for timely warning of ionospheric disturbances that disrupt C3I systems. In FY97 the project developed techniques to exploit Global Positioning System-Meteorological (GPS-Met) satellite data to validate and drive sensor-driven ionosphere specification models; incorporated Defense Meteorological Satellite Program (DMSP) sensor data into displays to alert C3I-system operators of disruptive ionospheric scintillation conditions; and assessed the viability of using UK ionospheric tomography data for large area ionospheric specification. Also in FY97, the project developed improved ground-based sensing techniques and visualization displays for specifying and forecasting ionospheric scintillation conditions that could lead to C3I system disruptions and outages. 		
Project NATO	Page 2 of 43 Pages	Exhibit R-2 (PE 0603790F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0603790F NATO Cooperative Research and Development	NATO
<ul style="list-style-type: none"> - (U) \$800 Future Multiband, Multiwaveform Modular Tactical Radio (FM3TR) (Rome Laboratory/France, Germany, United Kingdom) - Cooperative project to provide international capabilities in the area of interoperable and quickly reconfigurable communication systems using the US Speakeasy system as the baseline. In FY97-98 the project will finalize the first phase initiative of integrating the FM3TR test waveform. Demonstration and test plans are in their final phases or completed, and the US has modified the first phase of the Speakeasy system to incorporate the FM3TR waveform. In addition, the FM3TR waveform will also be hosted onto a demonstration model of the Speakeasy phase II system. NATO Cooperative R&D provided the funds necessary for the preparation of a successful test, integration and initial international demonstration. After a series of international demonstrations over the next year and a half, a future effort will target specific technology development and architecture modifications made evident by the initial first phase endeavor. - (U) \$150 Single Mode Optical Fibers for Array Imaging and for Environmental Sensing (Phillips Laboratory/United Kingdom) - Cooperative project to enhance the performance of single mode (SM) optical fibers for ultra-high angular resolution imaging in support of space surveillance needs. In FY97 the project completed the SM fiber optical link demonstrator and identified key parameters for the next generation link. The US developed the optical and electronic control loop for the link and the UK developed the prototype environmental control loop. The wavefront sensing strategy was discussed in detail. The US delivered the first 4 cores multi-core SM fiber and the UK delivered the first 6 cores multi-core SM fibers. Both prototypes underwent intensive tests. <p>(U) <u>New Projects:</u></p> <ul style="list-style-type: none"> - (U) \$200 Dense Metal Case Penetrating Weapon (DMCPW) (Wright Laboratory/United Kingdom) - Cooperative project to develop and demonstrate technology for a dense metal penetrating warhead, that is compatible with guidance kits such as PAVEWAY III and the Joint Deep Attack Munition (JDAM). This technology offers a two-fold increase in hard target defeat over current warhead case designs. The warhead will be compatible for carriage and release with future smaller aircraft, and stand-off weapons such as cruise missiles. Technology demonstration will be through subscale and full scale dynamic ground impact testing (sled and/or powder gun) with an option for flight demonstrations using PAVEWAY III guidance kits. In FY97 the project identified the most promising DMCPW warhead concepts and initiated US PAVEWAY III flight demonstration guidance kit and United Kingdom weaponization design studies. - (U) \$500 Free Piston Shock Tunnel/High Enthalpy Goettingen Project (Arnold Engineering and Development Center/Germany) - Cooperative project to significantly reduce the cost of acquiring technologies and ground test capabilities for the development of hypersonic flight systems by combining the complementary efforts of the US Free Piston Shock Tunnel (FPST) and Germany's High Enthalpy Goettingen (HEG) facilities. In FY97 details of test conditions and the test schedule were established with Germany. Common mechanical and electrical interfaces between the German HEG and US FPST facilities for diagnostics equipment were determined. The FPST facility was configured for the initial calibration tests. 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0603790F NATO Cooperative Research and Development	NATO
– (U) \$750	Programmable Integrated Ordnance Suite (PIOS) (Wright Laboratory/United Kingdom) - Cooperative project to develop and demonstrate integrated missile ordnance technologies, including imaging infrared target detection devices (TDD), mass-focused or directional warheads, and advanced initiation fireset. The primary goal is to improve counter-air lethality against advanced fighter, bomber, helicopter, and cruise missile targets. In FY97 the project focused on developing the modeling and simulation toolset to perform engineering design trades of concept TDD and warheads. Toward the end of FY97 the simulations were exercised to evaluate concept TDD and warhead technologies to assess lethality performance and technical risk.	
– (U) \$200	Adaptive Flexible Structures for Air Vehicle Applications (Wright Laboratory/Australia) - Cooperative project to analyze, develop and demonstrate an approach to suppressing buffet load-induced vibrations on vertical tail aircraft. In FY97 the project attached a US developed buffet load alleviation (BLA) control system to an F/A-18 test aircraft, installed the aircraft in Australia's International Follow-On Structural Testing Project (IFOSTP) facility, and began testing the BLA control system. In FY98, testing of the BLA control system will be completed, the performance and benefits of the BLA control system will be determined, and reports will be prepared documenting the development and test results of the BLA control system.	
– (U) \$450	Strengthening of Concrete Structures for Enhanced Structural Survivability Against Conventional and Terrorist Weapons (Wright Laboratory/Israel) - Cooperative project to develop rapid, inexpensive construction process to significantly increase the strength and resistance of existing or new conventional concrete and mason structures to terrorist vehicle bombs or tactical ballistic missile threats. Meets requirement to upgrade mission critical air base structures at both contingency and fixed bases, thereby reducing the need for new military construction. In FY97 the project selected, evaluated and tested advanced composite materials, application processes, and conducted structural component blast tests in the US. Concepts for strengthening masonry walls with composites, window retrofits, geotextile curtains, energy absorbing exterior panels, and joint reinforcement retrofits were investigated.	
– (U) \$9,767	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
	(U) <u>Continuing Projects Initiated in FY95 and FY96 Under PE 0603790D:</u>	
– (U) \$400	Image Information Reformatter (IIR) (Air Force Research Laboratory (formerly Rome Laboratory)/France) - Cooperative project to define, develop and demonstrate an Advanced Development Model (ADM) - IIR for the purpose of demonstrating interoperability among allied tactical imagery reconnaissance collection and ground systems. In FY98 Air Force Research Laboratory will competitively award a procurement contract to develop and demonstrate the US portion of the Phase Two ADM-IIR capability. The French Ministry of Defense will make a similar award to a French company. The core hardware portions of the ADM-IIR will be based on commercial-off-the-shelf equipment with some unique interfacing hardware and software.	

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development	PROJECT NATO
– (U) \$500	<p>Effects of the Ionosphere on Command, Control, Communications, and Intelligence (C3I) Systems (Air Force Research Laboratory (formerly Phillips Laboratory)/United Kingdom) - Cooperative project to leverage complementary ionospheric sensors and data to develop capabilities for timely warning of ionospheric disturbances that disrupt C3I systems. In FY98 the project will expand the coverage area for which C3I system outage forecasts and alerts can be provided to include the South America and the Atlantic regions. In addition, the project will initiate efforts to couple the sensor-driven Parameterized Ionosphere Specification Model (PRISM) to a United Kingdom analytic ray tracing code for radio wave propagation prediction applications; and develop algorithms to couple Global Position System-Meteorological (GPS-Met) satellite data into PRISM.</p>	
– (U) \$150	<p>Single Mode Optical Fibers for Array Imaging and for Environmental Sensing (Air Force Research Laboratory (formerly Phillips Laboratory)/United Kingdom) - Cooperative project to enhance the performance of single mode optical fibers for ultra-high angular resolution imaging in support of space surveillance needs. In FY98 the project will complete the laboratory tests of the US and UK prototype Multi-Core Single Mode Fibers (MCSMF) and move to field tests of the two prototypes. The project will evaluate which prototype is the best in terms of cost, reliability, etc. MCSMFs offer the potential for transmitting light and images more efficiently.</p>	
– (U) \$2,300	<p>Vista Warrior (Air Force Research Laboratory (formerly Armstrong Laboratory)/United Kingdom) - Cooperative project to develop and evaluate advanced helmet-mounted tracker and display (HMT/D) technologies, multi-sensory virtual interface concepts, and virtual display and control devices for incorporation into advanced aircraft. In FY98 the project will demonstrate Helmet-Vehicle Interface (HVI) for binocular HMT/Ds; develop color image source technology for a monocular HMT/D for use in fast-jets for air-to-air and air-to-ground missions; begin development of flight-worthy eye tracker for airborne eye pointing/targeting; and finalize selection of advanced controls and displays for demonstration in aircraft.</p>	
	<p>(U) <u>Continuing Projects Initiated in FY97 Under PE 0603790F:</u></p>	
– (U) \$1,100	<p>Dense Metal Case Penetrating Weapon (DMCPW) (Air Force Research Laboratory (formerly Wright Laboratory)/United Kingdom) - Cooperative project to develop and demonstrate technology for a dense metal penetrating warhead that is compatible with guidance kits such as PAVEWAY III and the Joint Deep Attack Munition (JDAM). This technology offers a two-fold increase in hard target defeat over current warhead case designs. The warhead will be compatible for carriage and release with future smaller aircraft, and stand-off weapons such as cruise missiles. Technology demonstration will be through subscale and full scale dynamic ground impact testing (sled and/or powder gun) with an option for flight demonstrations using PAVEWAY III guidance kits. In FY98 the project will complete preliminary design of the DMCPW warhead, US PAVEWAY III flight demonstration guidance kit, and United Kingdom weaponization design studies; begin DMCPW detailed design, development, and ground testing; and initiate procurement of PAVEWAY III flight demonstration guidance kits.</p>	

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BUDGET ACTIVITY 4 - Demonstration and Validation		February 1998
PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development		PROJECT NATO
– (U) \$550	<p>Strengthening of Concrete Structures for Enhanced Structural Survivability Against Conventional and Terrorist Weapons (Air Force Research Laboratory (formerly Wright Laboratory)/Israel) - Cooperative project to develop rapid, inexpensive construction process to significantly increase the strength and resistance of existing or new conventional concrete and mason structures to terrorist vehicle bombs or tactical ballistic missile threats. Meets requirement to upgrade mission critical air base structures at both contingency and fixed bases, thereby reducing the need for new military construction. In FY98 the project will continue to evaluate and select materials for further testing; test modules and components of structures under blast loading in the US and Israel; and conduct tests on complete structures in Israel. Systems validated on complete structures will include masonry wall reinforcement with composite bonding, geotextile “catch” curtains, energy absorbing window frames, and sacrificial exterior panels. Validated systems will be finalized and issued to users via field manual.</p>	
– (U) \$500	<p>Free Piston Shock Tunnel/High Enthalpy Goettingen Project (Arnold Engineering and Development Center/Germany) - Cooperative project to significantly reduce the cost of acquiring technologies and ground test capabilities for the development of hypersonic flight systems by combining the complementary efforts of the US Free Piston Shock Tunnel (FPST) and Germany’s High Enthalpy Goettingen (HEG) facilities. In FY98 FPST facility calibration tests and the first model will be done. Tests of the first two model configurations in the HEG will be completed. As test data becomes available, computational fluid dynamics analysis will begin. Continued development of non-intrusive diagnostics techniques will be a major part of the test programs at both wind tunnels.</p>	
– (U) \$500	<p>Programmable Integrated Ordnance Suite (PIOS) (Air Force Research Laboratory (formerly Wright Laboratory)/United Kingdom) - Cooperative project to develop and demonstrate integrated missile ordnance technologies, including imaging infrared target detection devices (TDD), mass-focused or directional warheads, and advanced initiation fireset. The primary goal is to improve counter-air lethality against advanced fighter, bomber, helicopter, and cruise missile targets. Technical risk areas identified in FY97 will be subjected to more detailed engineering analyses in FY98 to identify design approaches that mitigate risk. The FY98 deliverable will be a preliminary design of an integrated counter air ordnance suite with support engineering rationale and lethality performance predictions.</p> <p>(U) <u>Continuing Projects Initiated in FY97 Under PE 0603790D:</u></p>	
– (U) \$1,150	<p>Regional/Sector Air Operations Center (R/SAOC) Modernization Program (Electronic Systems Center/Canada) - Cooperative project to modernize existing R/SAOC computing and display capabilities to better support designated North American Aerospace Defense (NORAD) Command missions. In FY98 the project will continue integrating R/SAOC with the Theater Battle Management Core System (TBMCS), Global Command and Control System (GCCS), and the Defense Information Infrastructure/Common Operating Environment (DII/COE).</p>	
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PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development		PROJECT NATO
– (U) \$50	<p>Aftbody/NozzleAeroacoustics Project (ANAP) (Air Force Research Laboratory (formerly Wright Laboratory)/United Kingdom) - Cooperative project to develop jet screech frequency and amplitude prediction capabilities. Goal is to combine state-of-the-art US modeling techniques with unique United Kingdom anechoic chamber data to develop a tool which can be used for analysis and design tradeoffs. Nozzle screech has been shown to destroy exhaust structural components, and is particularly damaging in twin-jet configurations. Very limited technical data is currently available in this area. In FY97, acoustic data was obtained for a single round jet (hot, cold, with and without forward flight) in the United Kingdom facility at Pyestock. In FY98, efforts will focus on obtaining twin-jet screech data in the United Kingdom, and on extending the analysis capabilities of the screech tool to twin-jet configurations. When complete, this will represent the only twin-jet predictive capability available (numerical or analytical). In addition, work will continue towards analysis of existing data, and incorporation of new findings/physics into the existing jet pool.</p> <p>(U) <u>New Projects:</u></p>	
– (U) \$284	<p>Cooperative Research and Development Efforts in Imaging Spectrometer Development (Arnold Engineering and Development Center/Canada) - Cooperative project to pool the spatial and spectral advances of both the US and Canada, and develop a high-resolution sensor system capable of characterizing signatures of rockets and aircraft, for drug interdiction, and identifying trace quantities of a broad spectrum of gases in the environment. In FY98 the project will survey available components and state-of-the-art technology for focal plane arrays, interferometers, and data acquisition hardware; begin the preliminary design for a high-resolution sensor system; and identify long lead components.</p>	
– (U) \$100	<p>Effects of the Ionosphere on Communication and Surveillance Systems (Air Force Research Laboratory (formerly Phillips Laboratory)/France) - Cooperative project to leverage complementary equatorial ionospheric sensors and data to develop techniques for reliable warning of equatorial ionosphere disturbances that disrupt communication, surveillance, and Global Positioning System (GPS) navigation. This project will also incorporate a variety of French mid-latitude and equatorial ionosphere data and radio wave propagation data to validate US ionospheric specification and forecast models and radio wave propagation prediction techniques.</p>	
– (U) \$200	<p>Observations and Modeling for Space Weather (Air Force Research Laboratory (formerly Phillips Laboratory)/Germany) - Cooperative project involving US and German satellite sensors and experiments to provide coordinated observations and modeling of solar impact on space environment to forecast the global ionosphere and satellite drag. In FY98 the project will modify models to accept solar inputs; begin improvements in use of both currently available sensor data and future operational sensor data from sources such as the Defense Meteorological Satellite Program (DMS) ultraviolet sensors.</p>	
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BUDGET ACTIVITY 4 - Demonstration and Validation		February 1998
PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development		PROJECT NATO
– (U) \$200	<p>Cooperative Space Measurements (Air Force Research Laboratory (formerly Phillips Laboratory)/Germany) - Cooperative project to fly a Department of Defense developed space plasma detector aboard a German scientific spacecraft in 1999. Joint exchange and analysis of scientific data from this mission will be used to develop better descriptive and predictive models of the space environment, enhancing the reliability of space-based communications and navigation capabilities for the US and its allies. In FY98 the Air Force Research Laboratory will fabricate, test, and deliver the flight unit to the German spacecraft integrator, as well as support spacecraft integration and testing.</p>	
– (U) \$180	<p>Project Refractive Turbulence (Air Force Research Laboratory (formerly Phillips Laboratory)/Australia) - Cooperative project to obtain accurate, statistically significant, world wide turbulence measurements. The turbulence data base is essential to support studies that evaluate atmospheric refraction propagation effects on the design/performance of the Airborne Laser (ABL) and the Defense Airborne Reconnaissance Office's (DARO's) high-altitude Unmanned Aerial Vehicles (UAVs) communication and surveillance systems. Data acquired also has direct applicability in assessing refractive effects on performance of Airborne Warning and Control Systems (AWACS) and Joint Surveillance Target Attack Radar Systems (JSTARS). In FY98 the project will complete development of the faster response temperature sensor, adjust the software in the master program controlling data acquisition, and install a third turbulence probe on Australia's research aircraft. Mathematical analysis support will be provided for the two measurement campaigns in the western Mediterranean and southeast Australia.</p>	
– (U) \$100	<p>Metal Matrix Composites for Aerospace Applications (Air Force Research Laboratory (formerly Wright Laboratory)/United Kingdom) - Cooperative project to improve the properties and processing of silicon carbide (SiC) - reinforced Titanium (Ti) - alloy and Aluminum (Al) - alloy metal matrix composites (MMCs) for aerospace applications. In FY98 the United Kingdom will initiate production of matrix-coated SiC fiber and conduct carbon coating deposition trials. The coated fibers will be provided to the US for characterization. A second project will determine the effect of fiber spacing defects on the transverse mechanical properties of fiber-reinforced Ti-alloy MMCs. Ti-alloy coated SiC fibers will be supplied by the United Kingdom and laboratory test samples will be prepared and tested in the US. A third project will improve the mechanical properties of SiC-reinforced Al alloy MMCs through the control of the distribution of the reinforcing particles.</p>	
– (U) \$300	<p>Advanced Combustor Chamber Concepts Program (Air Force Research Laboratory (formerly Wright Laboratory)/France) - Cooperative project to develop and demonstrate a composite combustor structure suitable for use in advanced hypersonic weapon systems operating to Mach 8 on liquid hydrocarbon fuels. Resulting engines will be simpler, easier to cool, lower weight, and more durable than baseline metallic designs. In FY98 the project will establish a conceptual combustor design to determine thermal and structural requirements for each of the candidate materials; characterize each candidate material and corresponding fabrication technique; fabricate and begin testing sub-element panels at representative thermal and mechanical loads.</p>	
– (U) \$450	<p>Integrated Tactical Aircraft Control (ITAC) Program (Air Force Research Laboratory (formerly Wright Laboratory)/France) - Cooperative project to develop, integrate and demonstrate critical flight control and flight management technologies that enable cooperative flight operations of a package comprised of manned and uninhabited combat air vehicles (UCAVs). The cooperative control architecture enables management and control of an integrated strike package by the aircrews in the combat aircraft. In FY98 the project will develop the appropriate documentation and technical definition in order to achieve a common understanding of system level requirements, program tasks and associated major program deliverables.</p>	
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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0603790F NATO Cooperative Research and Development	NATO
– (U) \$400	Anthropometric Accommodation in Crew Systems (Air Force Research Laboratory (formerly Armstrong Laboratory)/The Netherlands) - Cooperative project to establish (a) a collection of three-dimensional (3-D) anthropometric data which accurately and consistently describes the variability of men and women in both Europe and the US (b) high quality methods for accommodation and interoperability assessment of crew systems and (c) methods for combining the data base with the assessment methods to assure accommodation and interoperability is achieved in the design process. In FY98 the project will collect the first half of the 3-D data sets in the United States and initiate the aircraft measurements.	
– (U) \$400	Aging Aircraft Life Prediction /Extension (Air Force Research Laboratory (formerly Wright Laboratory)/Australia) - Cooperative project to investigate the damage that can degrade an aircraft's service life, and develop the technology to ensure the structural integrity of aging aircraft with such damage present. This project will focus on composite patch repairs of metallic structures, widespread fatigue damage including multiple-element damage and multiple site damage, techniques for predicting the effects of corrosion and the interaction with fatigue loads, and sensors for structural health monitoring. In FY98 the project will document experience with widespread fatigue damage and composite patch repairs, develop analysis techniques for corrosion/fatigue, and evaluate composite patch repair analysis techniques.	
– (U) \$350	Structural Integrity of Aging Aircraft (Air Force Research Laboratory (formerly Wright Laboratory)/Canada) - Cooperative project to investigate the damage that can degrade an aircraft's service life, and develop the technology to ensure the structural integrity of aging aircraft with such damage present. This project will focus on composite patch repairs for metallic structures, widespread fatigue damage, life extension techniques for metallic structures, corrosion and its interaction with fatigue, structural dynamics with emphasis on weapon bay acoustics, and structural health monitoring with emphasis on sensor development. In FY98 the project will document experience with widespread fatigue damage and evaluate composite patch repair analysis techniques.	
– (U) \$250	Airworthiness of Aging Aircraft (Air Force Research Laboratory (formerly Wright Laboratory)/United Kingdom) - Cooperative project to investigate the damage that can degrade an aircraft's service life, and develop the technology to ensure the structural integrity of aging aircraft with such damage present. This project will focus on composite patch repairs for metallic structures, techniques for predicting the effects of corrosion and the interaction with fatigue loads, and structural life extension techniques for metal structures, such as the fastener-hole cold expansion process. In FY98 the project will document experience with corrosion/fatigue and composite patch repairs, develop analysis techniques for life enhancement, and evaluate composite patch repair analysis techniques.	
– (U) \$10,414	Total	

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<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <p align="center">(U) <u>Continuing Projects Initiated in FY96 under PE 0603790D:</u></p> <ul style="list-style-type: none"> - (U) \$1,200 Image Information Reformatter (IIR) (Air Force Research Laboratory/France) - Cooperative project to define, develop and demonstrate an Advanced Development Model (ADM) - IIR for the purpose of demonstrating interoperability among allied tactical imagery reconnaissance collection and ground systems. In FY99 anticipate completion of initial ADM design and establishment of team of French and US contractors to work the common development of IIR core computer programs. Initiate demonstration activities using interfaces provided by a single country and then replicate this for the other country. - (U) \$400 Effects of the Ionosphere on Command, Control, Communications, and Intelligence (C3I) Systems (Air Force Research Laboratory/United Kingdom) - Cooperative project to leverage complementary ionospheric sensors and data to develop capabilities for timely warning of ionospheric disturbances that disrupt C3I systems. In FY99 the project will expand the coverage area for which C3I system outage forecasts and alerts can be provided to include the North Africa/Middle East region; the potential for exploiting Global Position System-Meteorological (GPS-Met) satellite data to drive near real-time specifications of the ionosphere will be assessed; and the use of multiple mid- and high latitude ionospheric sensor data to improve the accuracy of space surveillance radar. Range corrections will be validated. - (U) \$1,000 Vista Warrior (Air Force Research Laboratory/United Kingdom) - Cooperative project to develop and evaluate advanced helmet-mounted tracker and display (HMT/D) technologies, multi-sensory virtual interface concepts, and virtual display and control devices for incorporation into advanced aircraft. In FY99 the project will select the image source technology for color HMT/Ds; evaluate advanced controls and displays in a fast-jet aircraft; conduct laboratory assessment of eye tracker technologies; and demonstrate color monocular HMT/D. <p align="center">(U) <u>Continuing Projects Initiated in FY97 under PE 0603790F:</u></p> <ul style="list-style-type: none"> - (U) \$1,697 Dense Metal Case Penetrating Weapon (DMCPW) (Air Force Research Laboratory/United Kingdom) - Cooperative project to develop and demonstrate technology for a dense metal penetrating warhead, that is compatible with guidance kits such as PAVEWAY III and the Joint Deep Attack Munition (JDAM). This technology offers a two-fold increase in hard target defeat over current warhead case designs. The warhead will be compatible for carriage and release with future smaller aircraft, and stand-off weapons such as cruise missiles. Technology demonstration will be through subscale and full scale dynamic ground impact testing (sled and/or powder gun) with an option for flight demonstrations using PAVEWAY III guidance kits. In FY99 the project will complete the DMCPW warhead detailed design, development, and sled tests; delivery of US PAVEWAY III flight demonstration guidance kits; integrate the DMCPW warhead and PAVEWAY III guidance kit and flight test from an F-16 aircraft. 		
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4 - Demonstration and Validation	0603790F NATO Cooperative Research and Development	NATO
<ul style="list-style-type: none"> - (U) \$200 Free Piston Shock Tunnel/High Enthalpy Goettingen Project (Arnold Engineering and Development Center/Germany) - Cooperative project to significantly reduce the cost of acquiring technologies and ground test capabilities for the development of hypersonic flight systems by combining the complementary efforts of the US Free Piston Shock Tunnel (FPST) and Germany's High Enthalpy Goettingen (HEG) facilities. In FY99 the project will complete FPST testing on the second and third model configurations; complete HEG testing on the third model; complete computational fluid dynamics analysis on all data; and complete final report. (U) <u>Continuing Projects Initiated in FY98 under PE 0603790D:</u> - (U) \$750 Advanced Hybrid Propulsion Technologies Cooperative Research Project (Air Force Research Laboratory/Japan) - Cooperative project to develop hybrid propulsion technology for air-to-air missiles. In FY99 the project will develop the subsystem components necessary to meet the overall project requirements of increased performance and safety, as well as providing energy management capability. The subsystem components include an injector, gas generator pressurization system, flow control valve, liquid oxidizer expulsion system, oxidizer chemistry development, and oxidizer tankage. - (U) \$1,500 Advanced Crew Ejection Seat (ACES) II - Ejection Seat Cooperative Modification Project (Human Systems Center/Japan) - Cooperative project to develop and design a modification kit that can be retrofitted to the ACES II ejection to increase the safety and survivability of aircrew members by: increasing the stability of the seat; increasing the seat/accommodation range; and adding limb restraints. ACES II ejection seat improvements include a gender free operational capability that assures equally reduced mortality rates and serious injuries for both male and female aircrew members. The successful completion of this program is intended to reduce the number of fatalities and serious injuries for all weight classes during high speed ejection's and increase anthropometric range for aircrew population requirements. Work to be accomplished in FY99 will include the purchase of the remaining seats and hardware for the upcoming tests. The design stages will be complete and the qualification program will be initiated. - (U) \$1,000 Air Battle Management Capabilities (Electronic Systems Center/United Kingdom) - Cooperative project to develop the means for a Combined Air Operations Center (CAOC) to dynamically retask airborne and ground alert assets utilizing the capabilities of emerging national/coalition systems. The project will expand the ability of the US Theater Battle Management Core Systems (TBMCS) and UK Air Command and Control System (ACCS) to accept input from and provide output to war gaming models; establish interoperability between existing and emerging air battle planning and execution systems; provide each nation with all Air Battle Management related engineering, manufacturing, and development/production computer software documentation necessary to enable development and integration; investigate technologies and techniques to facilitate the evolution and incorporation of Theater Missile Defense (TMD) command and control capabilities into force level systems; develop and implement the ability to conduct dispersed war gaming and mission rehearsal capability at both the force and unit level. 		
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4 - Demonstration and Validation	0603790F NATO Cooperative Research and Development	NATO
<ul style="list-style-type: none"> - (U) \$250 Air Command, Control, Communications and Intelligence Capabilities (Electronic Systems Center/NATO Consultation, Command, and Control (C3) Agency) - Cooperative project to develop a fieldable interface between the US Contingency Theater Automated Planning System (CTAPS)/TBMCS and NATO Initial CAOC Capability (ICC) and the future NATO Air Command and Control System (ACCS). This cooperative R&D effort will support air campaign planning and execution for joint and combined air operations. The scope of work to be accomplished includes advanced R&D into shared data environment, developing a concept of operation for the transfer of control between National and NATO C4I systems without interrupting combat operation; and the extension of a middleware/translator product needed for the successful prosecution of a combined/joint air operation. (U) <u>Continuing Projects Initiated in FY98 under PE 0603790F:</u> - (U) \$250 Cooperative Research and Development Efforts in Imaging Spectrometer Development (Arnold Engineering and Development Center/Canada) - Cooperative project to pool the spatial and spectral advances of both the US and Canada, and develop a high-resolution sensor system capable of characterizing signatures of rockets and aircraft, for drug interdiction, and identifying trace quantities of a broad spectrum of gases in the environment. In FY99 the project will develop a brass board for concept checkout and incorporate improvements into an advanced design. - (U) \$100 Effects of the Ionosphere on Communication and Surveillance Systems (Air Force Research Laboratory/France) - Cooperative project to leverage complementary equatorial ionospheric sensors and data to develop techniques for reliable warning of equatorial ionosphere disturbances that disrupt communication, surveillance, and Global Positioning System (GPS) navigation. In FY99 the project will incorporate French equatorial ionosphere data from North Africa with Air Force Research Laboratory data from South America and the Mid-Atlantic sector to characterize ionospheric scintillation conditions that disrupt communications, surveillance, and navigation systems. - (U) \$200 Observations and Modeling for Space Weather (Air Force Research Laboratory/Germany) - Cooperative project involving US and German satellite sensors and experiments to provide coordinated observations and modeling of solar impact on space environment to forecast the global ionosphere and satellite drag. In FY99 the project will complete the modification of models to accept solar inputs; continue improving the use of available sensor data; and start improvements in the use of the Defense Meteorological Satellite Program (DMSP) ultraviolet sensor data. - (U) \$75 Cooperative Space Measurements (Air Force Research Laboratory/Germany) - Cooperative project to fly a Department of Defense developed space plasma detector aboard a German scientific spacecraft in 1999. Joint exchange and analysis of scientific data from this mission will be used to develop better descriptive and predictive models of the space environment, enhancing the reliability of space-based communications and navigation capabilities for the US and its allies. In FY99 the Air Force Research Laboratory will support final spacecraft testing, spacecraft launch, on-orbit operations, and begin plasma detector data analysis. 		
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4 - Demonstration and Validation	0603790F NATO Cooperative Research and Development	NATO
– (U) \$145	<p>Project Refractive Turbulence (Air Force Research Laboratory/Australia) - Cooperative project to obtain accurate, statistically significant, world wide turbulence measurements. The turbulence data base is essential to support studies that evaluate atmospheric refraction propagation effects on the design/performance of the Airborne Laser (ABL) and the Defense Airborne Reconnaissance Office's (DARO's) high-altitude Unmanned Aerial Vehicles (UAVs) communication and surveillance systems. Data acquired also has direct applicability in assessing refractive effects on performance of Airborne Warning and Control Systems (AWACS) and Joint Surveillance Target Attack Radar Systems (JSTARS). In FY99 the project will support data reduction and analyses of aircraft turbulence measurements in Korea/Japan area and Australia.</p>	
– (U) \$100	<p>Metal Matrix Composites for Aerospace Applications (Air Force Research Laboratory/United Kingdom) - Cooperative project to improve the properties and processing of silicon carbide (SiC) -reinforced Titanium (Ti) - alloy and Aluminum (Al) - alloy metal matrix composites for aerospace applications. In FY99 improved processes for matrix coatings and carbon coatings on SiC monofilaments will be specified. Material produced will be provided to the Air Force Research Laboratory for characterization and analysis.</p>	
– (U) \$450	<p>Advanced Combustor Chamber Concepts Program (Air Force Research Laboratory/France) - Cooperative project to develop and demonstrate a composite combustor structure suitable for use in advanced hypersonic weapon systems operating to Mach 8 on liquid hydrocarbon fuels. Resulting engines will be simpler, easier to cool, lower weight, and more durable than baseline metallic designs. In FY99 the project will complete sub-element panel testing; reevaluate each design approach; and initiate detailed design and fabrication of the full scale composite combustor wall panels.</p>	
– (U) \$400	<p>Integrated Tactical Aircraft Control (ITAC) Program (Air Force Research Laboratory/France) - Cooperative project to develop, integrate and demonstrate critical flight control and flight management technologies that enable cooperative flight operations of a package comprised of manned and uninhabited combat air vehicles (UCAVs). The cooperative control architecture enables management and control of an integrated strike package by the aircrews in the combat aircraft. In FY99 the project will develop core flight control algorithms, situation assessment methods, optimized flight management and health monitoring system architectures.</p>	
– (U) \$400	<p>Anthropometric Accommodation in Crew Systems (Air Force Research Laboratory/The Netherlands) - Cooperative project to establish (a) a collection of three-dimensional (3-D) anthropometric data which accurately and consistently describes the variability of men and women in both Europe and the US (b) high quality methods for accommodation and interoperability assessment of crew systems and (c) methods for combining the data base with the assessment methods to assure accommodation and interoperability is achieved in the design process. In FY99 the project will finish the United States 3-D data collection and the first half of the European and initiate the augmented reality assessment of the aircraft crewstations.</p>	
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4 - Demonstration and Validation	0603790F NATO Cooperative Research and Development	NATO
<ul style="list-style-type: none"> - (U) \$400 Aging Aircraft Life Prediction/Extension (Air Force Research Laboratory/Australia) - Cooperative project to investigate the damage that can degrade an aircraft's service life, and develop the technology to ensure the structural integrity of aging aircraft with such damage present. This project will focus on composite patch repairs of metallic structures, widespread fatigue damage including multiple-element damage and multiple site damage, techniques for predicting the effects of corrosion and the interaction with fatigue loads, and sensors for structural health monitoring. In FY99 the project will complete documenting experience with widespread fatigue damage and composite patch repairs, continue developing analysis techniques for corrosion/fatigue, continue evaluating composite patch repair analysis techniques, and initiate in-service evaluation of corrosion sensor. - (U) \$350 Structural Integrity of Aging Aircraft (Air Force Research Laboratory/Canada) - Cooperative project to investigate the damage that can degrade an aircraft's service life, and develop the technology to ensure the structural integrity of aging aircraft with such damage present. This project will focus on composite patch repairs for metallic structures, widespread fatigue damage, life extension techniques for metallic structures, corrosion and its interaction with fatigue, structural dynamics with emphasis on weapon bay acoustics, and structural health monitoring with emphasis on sensor development. In FY99 the project will develop analytical models for widespread fatigue damage and corrosion/fatigue, complete evaluation of composite patch repair analysis techniques, and identify in-service dynamics problems. - (U) \$250 Airworthiness of Aging Aircraft (Air Force Research Laboratory/United Kingdom) - Cooperative project to investigate the damage that can degrade an aircraft's service life, and develop the technology to ensure the structural integrity of aging aircraft with such damage present. This project will focus on composite patch repairs for metallic structures, techniques for predicting the effects of corrosion and the interaction with fatigue loads, and structural life extension techniques for metal structures, such as the fastener-hole cold expansion process. In FY99 the project will develop analysis techniques for corrosion/fatigue and continue developing analysis techniques for life enhancement and composite patch repairs. - (U) \$11,117 Total 		
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<p>The reallocation sources included:</p> <ul style="list-style-type: none">- \$562,000 from Advanced Flooding Agent (Wright Laboratory/United Kingdom), since the proposed agreement was withdrawn after further review. All funding and activities dealing with Halon 1301 replacements will be addressed by DDR&E's Next Generation Plan (NGP).- \$280,000 from Cooperative Research and Development Efforts in Imaging Spectrometer Development (Arnold Engineering and Development Center/Canada), since the proposed agreement was placed on hold pending completion of a HQ USAF review. HQ USAF completed its review and rescoped the agreement. The agreement has been forwarded to Canada for negotiations and is currently scheduled to be concluded in FY98. <p><u>In FY98</u> the Air Force will allocate additional funding for the following projects to take advantage of favorable program and technological developments: Single Mode Optical Fibers for Array Imaging and Environmental Sensing (Air Force Research Laboratory (formerly Phillips Laboratory)/United Kingdom): \$50,000; Strengthening of Concrete Structures for Enhanced Structural Survivability Against Conventional and Terrorist Weapons (Air Force Research Laboratory (formerly Wright Laboratory)/Israel): \$100,000; Cooperative Space Measurements (Air Force Research Laboratory (formerly Phillips Laboratory)/Germany): \$100,000; Aftbody/Nozzle Aeroacoustics Project (ANAP) (Air Force Research Laboratory (formerly Wright Laboratory)/United Kingdom): \$50,000 (This project was initially funded in FY97 under OSD NATO Cooperative R&D PE0603790D and listed in the 1997 Annual Report to Congress on International Cooperative Research and Development).</p>		
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<p>(U) Schedule: <u>Dense Metal Case Penetrating Weapon (DMCPW) (Wright Laboratory/United Kingdom)</u> - Original planning with the United Kingdom led to the development of a schedule which would culminate in a weapon demonstration in late FY98 to early FY99. Subsequent planning and coordination with the United Kingdom moved the demonstration to late FY99.</p> <p><u>Image Information Reformatter (IIR) (Rome Laboratory/France)</u> - Award of the Phase II contract for the development and evaluation of the Advanced Development Model IIR has been rescheduled due to delays in coordinating and structuring the program with the French.</p> <p><u>Cooperative Research and Development Efforts in Imaging Spectrometer Development (formerly Cooperation in Infrared Spectral Imaging for Low Observable Signatures (Arnold Engineering and Development Center/Canada)</u> - The projected signature of the agreement shifted from FY97 to FY98, since the proposal was placed on hold pending completion of a HQ USAF review. HQ USAF completed its review and rescoped the agreement. The agreement has been forwarded to Canada for negotiations.</p> <p><u>Effects of the Ionosphere on Communications and Surveillance Systems (Phillips Laboratory/France)</u> - The projected signature of the agreement shifted from FY97 to FY98 due to recent changes in how the French Ministry of Defense processes international agreements.</p> <p>(U) Technical: <u>Very High Resolution Imaging by Interferometry (Phillips Laboratory/France)</u> - The project was put on hold pending completion of an OSD review and subsequently withdrawn.</p> <p><u>Advanced Flooding Agent (Wright Laboratory/United Kingdom)</u> - The Air Force withdrew the proposal since DDR&E recently approved a comprehensive Next Generation Plan (NGP) to address Halon 1301 replacements. The Air Force's Advanced Flooding Agent proposal was initiated before the NGP was developed and approved.</p> <p><u>Transatlantic Research into Air Combat Engagements (TRACE) Phase 2 (Wright Laboratory/Germany)</u> - The Air Force withdrew from the proposed Phase II effort, since the research emphasis within the Simulation Control Integration and Assessment Branch has changed from network optimization to flight control research.</p>		
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(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>												
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>		
(U) N/A												
Related RDT&E:												
(U) This program element complements OSD NATO Cooperative R&D PE 0603790D which funds the first year only of any new DoD agreement. It also provides ICRD&A funds for USAF Laboratory 6.1 through 6.3 programs and USAF Product, Test, and Logistics Center 6.4 through 6.5 programs. Management support for Air Force NATO Cooperative R&D PE 0603790F is funded in Air Force International Activities PE 1001004F at the level of \$300,000 per fiscal year.												
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Image/Information Reformatter (IIR)												
(U) Concept definition activities	X					X						
(U) Draft program implementation plan	X					X						
(U) Request for proposal released							X					
(U) Contract award								X				
(U) Development and fabrication of Advanced Development Model IIR and interfaces								X			X	
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					<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
					1	2	3	4	1	2	3	4	1	2	3	4
(U) Experimental Air Operations Center (EAOC)																
(U) Research and advanced development into key command and control (C2) areas of Combined Air Operations Center (CAOC) functionality					X											X
(U) Early fielding in Theater Battle Management Core System (TBMCS) core releases								X				X				
(U) Project demonstration								X		X		X				
(U) Vista Warrior																
(U) Develop and demonstrate advanced technologies and interface concepts in labs and simulators					X								X			
(U) Demonstrate the technology developed on operational fast jet aircraft								X								X
(U) Assess advanced head/helmet tracker technologies								X			X					
(U) Demonstrate advanced head/helmet tracker												X	X			

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	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Effects of the Ionosphere on C3I Systems												
(U) Validate Global Positioning System-Meteorological (GPS-Met) data to drive sensor driven ionospheric models		X										
(U) Assess near real-time UK ionospheric tomography data in the US Parameterized Ionosphere-Specification Model (PRISM)				X								
(U) UK provide the latest Ray-Tracing algorithms for use with the PRISM						X						
(U) Assess UK oblique sounder system					X							
(U) Expand C3I outage alert areas to include South American and Atlantic sectors						X						
(U) Couple US PRISM model to UK Ray-Tracing Code									X			
(U) Develop algorithms to couple GPS-Met data into PRISM model										X		
(U) Expand C3I outage alert coverage to include North Africa/Middle East sector												X
(U) Assess use of GPS-Met data for global ionosphere specification application												X
(U) Validate the use of multi-ionospheric sensor data/displays to improve the accuracy of surveillance radar range corrections												X
Project NATO												

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		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Future Multiband, Multi-waveform Modular Tactical Radio (FM3TR)												
(U) Waveform definition completed	X											
(U) Waveform hosting				X								
(U) US demonstration					X							
(U) International demos							X		X			
(U) Single Mode (SM) Optical Fibers for Array Imaging and for Environmental Sensing												
(U) SM optical fiber signal demonstration, identification of key parameters, development of control loops	X											
(U) Evaluation of Wavefront Sensing (WFS) techniques and characterization of Multi-Core SM Fiber (MCSMF)	X			X								
(U) Test and evaluation of MCSMF					X			X				
(U) Construction of fiber sensor and prototype									X			X

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	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Cooperative Research and Development Efforts in Imaging Spectrometer Development												
(U) Agreement signed							X					
(U) Preliminary design							X					
(U) Concept checkout									X			
(U) Interim report												X
(U) Advanced design												X
(U) Effects of the Ionosphere on Communications and Surveillance Systems												
(U) Agreement signed								X				
(U) US provide ionosphere model									X			
(U) Identify/exchange available US/France equatorial ionosphere data												X
(U) US and France specify requirements for low power digital ionospheric sounder (LPDIS)										X		

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BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development					PROJECT NATO			
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2	3	4	
(U) Free Piston Shock Tunnel/High Enthalpy Goettingen Project													
(U) Agreement signed			X										
(U) Specify testing conditions, test articles, instrumentation and diagnostics			X	X									
(U) Calibration, fabrication of models, testing						X			X				
(U) Exchange consultations			X			X							
(U) Exchange instrumentation and diagnostic articles						X	X		X	X			
(U) Computational fluid dynamics code development and validation					X					X			
(U) Final report											X		
(U) Programmable Integrated Ordnance Suite (PIOS)													
(U) Agreement signed		X											
(U) Model and evaluate concept ordnance suites		X			X								
(U) Perform preliminary design of selected ordnance suite concept						X		X					
(U) Perform detailed engineering design of fuze and warhead									X			X	

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BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development						PROJECT NATO	
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Observations and Modeling for Space Weather												
(U) Agreement signed								X				
(U) Exchange existing data								X	X			
(U) Analyze existing data								X		X		
(U) Upgrade models									X			X
(U) Regional/Sector Air Operations Center (R/SAOC) Modernization Program												
(U) Request for proposal released	X											
(U) Contract award		X										
(U) Early fielding											X	
(U) Strengthening of Concrete Structures for Enhanced Structural Survivability Against Conventional and Terrorist Weapons												
(U) Agreement signed		X										
(U) Materials evaluation and selection				X	X							
(U) Structural component evaluation			X			X						
(U) Full structure field tests					X			X				
(U) Data reduction/analysis/field manual								X		X		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development						PROJECT NATO	
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Cooperative Space Measurements												
(U) Preliminary design	X	X										
(U) Detailed design		X		X								
(U) Agreement signed							X					
(U) Development and test				X		X						
(U) Delivery to spacecraft integrator						X						
(U) Spacecraft integration and test						X			X			
(U) Launch											X	
(U) Data collection											X	X
(U) Project Refractive Turbulence												
(U) Design tail probe support					X							
(U) Build tail probe mount						X						
(U) Install tail turbulence probe							X					
(U) Aircraft certification					X	X						
(U) Agreement signed						X						
(U) Test measuring systems on aircraft					X	X						
(U) Flight measurements						X		X		X		X
(U) Field measurement reports						X				X		
(U) Data reduction						X		X		X		X
(U) Data analysis						X						X

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	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Metal Matrix Composites (MMCs) for Aerospace Applications												
(U) Agreement signed					X							
(U) Concept definition			X	X								
(U) Produce and evaluate MMCs					X							X
(U) Specify improved MMCs									X			X
(U) Produce and evaluate improved MMC												X
(U) Advanced Combustor Chamber Concepts Program												
(U) Agreement signed						X						
(U) Combustor conceptual design						X						X
(U) Material/fabrication sample tests						X		X				
(U) Cooled panel tests										X		X
(U) Evaluate design approach												X
(U) Integrated Tactical Aircraft Control (ITAC) Program												
(U) Agreement signed					X							
(U) System definition					X			X				
(U) System design							X					X
(U) Detailed design									X			X

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998					
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development						PROJECT NATO					
					<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
					1	2	3	4	1	2	3	4	1	2	3	4
(U) Anthropometric Accommodation in Crew Systems																
(U) Agreement signed																
(U) Conduct anthropometric survey																
(U) Assess subjects in actual cockpits																
(U) Assess one model in the US and one model in The Netherlands																
(U) Aftbody/Nozzle Aeroacoustics Program (ANAP)																
(U) Agreement signed																
(U) US modeling and analysis activities																
(U) United Kingdom single jet hot/cold data																
(U) US/United Kingdom planning and data reduction																
(U) United Kingdom twin jet hot/cold data																
(U) Application of screech tool to target twin-jet fighter application																

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998					
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					<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
					1	2	3	4	1	2	3	4	1	2	3	4
(U) Aging Aircraft Life Prediction/ Extension																
(U) Agreement Signed									X							
(U) Document widespread fatigue damage experience										X						
(U) Coordinate with US														X		
(U) Develop corrosion/fatigue analysis techniques												X				
(U) Document composite patch service experience									X							
(U) Evaluate existing composite patch analysis techniques for metallic structures									X							
(U) Identify health monitoring sensors									X							
(U) Prepare for flight tests												X				
(U) Airworthiness of Aging Aircraft																
(U) Agreement signed									X							
(U) Develop life enhancement analysis techniques														X		
(U) Conduct experiments															X	
(U) Document corrosion/fatigue service experience												X				
(U) Document composite patch service experience									X							
(U) Evaluate existing composite patch analysis techniques for metallic structures												X				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)										DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development					PROJECT NATO		
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Structural Integrity of Aging Aircraft												
(U) Agreement signed					X							
(U) Document widespread fatigue damage service experience								X				
(U) Develop widespread fatigue damage analytical models												X
(U) Develop corrosion/fatigue analysis techniques										X		
(U) Evaluate existing composite patch analysis techniques for metallic structures								X				
(U) Identify candidate solutions for dynamic control												X
(U) Develop health monitoring brassboard models											X	
(U) Identify fatigue life enhancement techniques												X
(U) Advanced Hybrid Propulsion Technologies Cooperative Research Project												
(U) Agreement signed									X			
(U) Detail design					X							
(U) Oxidizer expulsion system					X							X
(U) Controls					X	X			X		X	
(U) Injector						X				X	X	
(U) Pressurization system					X						X	
(U) Oxidizer development					X							X

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BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development						PROJECT NATO					
					<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
					1	2	3	4	1	2	3	4	1	2	3	4
(U) Air Battle Management Capabilities																
(U) Agreement Signed									X							
(U) Draft program and implementation plan										X	X					
(U) Contract change request released											X					
(U) Issue technical task descriptive													X			
(U) Program definition/Project plan											X	X				
(U) Research and develop capabilities defined in project plan												X			X	
(U) Early fielding of developed capabilities into US Theater Battle Management Core System (TBMCS) and UK Air Command and Control System (ACCS)													X		X	
(U) Battle Lab verification and development test													X		X	
(U) Project demonstration															X	
(U) Advanced Crew Ejection Seat (ACES) II - Ejection Seat Cooperative Modification Project																
(U) ACES II Preliminary design									X							
(U) Agreement signed									X							
(U) Engineering, manufacturing, development											X					
(U) Detailed design												X				
(U) Complete design														X		
(U) Qualification program															X	
Project NATO																

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BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development					PROJECT NATO						
					<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
					1	2	3	4	1	2	3	4	1	2	3	4
(U) Air Command, Control, Communications and Intelligence Capabilities																
(U) Agreement Signed																
(U) Draft program and implementation plan																
(U) Contract change request released																
(U) Issue technical task descriptive																
(U) Program definition																
(U) Scope work effort to achieve shared data environment																
(U) Develop translator extensions																
(U) US/NATO Battle Lab verification and development test																
(U) Examine US/NATO Concept of Operations in coalition environment in terms of shared data environment																

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE																																																												
BUDGET ACTIVITY 4 - Demonstration and Validation		February 1998																																																												
PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development		PROJECT NATO																																																												
<p>(U) A. Project Cost Breakdown (\$ in Thousands) *Prior to FY97 OSD funded NATO Cooperative R&D agreements under PE0603790D. In FY97 responsibility for funding NATO Cooperative R&D agreements will be shared with the Services. Prior OSD cost information for Air Force projects is not shown.</p> <p>Complete information regarding the use of NATO Cooperative R&D funds is not available for all proposed agreements, since some are still being negotiated or were recently signed. In addition, future funding for continuing agreements is not available in all instances because the funds are used as needed to supplement a project office's related 6.1 through 6.5 RDT&E appropriations.</p> <table border="1"> <thead> <tr> <th></th> <th><u>FY 1997</u></th> <th><u>FY 1998</u></th> <th><u>FY 1999</u></th> </tr> </thead> <tbody> <tr> <td>(U) Image Information Reformatter (IIR)</td> <td align="right">475</td> <td align="right">400</td> <td align="right">1,200</td> </tr> <tr> <td>(U) Experimental Air Operations Center (EAOC)</td> <td align="right">2,700</td> <td align="right">0</td> <td align="right">0</td> </tr> <tr> <td>(U) Vista Warrior</td> <td align="right">2,742</td> <td align="right">2,300</td> <td align="right">1,000</td> </tr> <tr> <td>(U) Effects of the Ionosphere on Command, Control, Communications, and Intelligence (C3I) Systems</td> <td align="right">800</td> <td align="right">500</td> <td align="right">400</td> </tr> <tr> <td>(U) Future Multiband, Multiwaveform Modular Tactical Radio (FM3TR)</td> <td align="right">800</td> <td align="right">0</td> <td align="right">0</td> </tr> <tr> <td>(U) Single Mode Optical Fibers for Array Imaging and for Environmental Sensing</td> <td align="right">150</td> <td align="right">150</td> <td align="right">0</td> </tr> <tr> <td>(U) Free Piston Shock Tunnel/High Enthalpy Goettingen Project</td> <td align="right">500</td> <td align="right">500</td> <td align="right">200</td> </tr> <tr> <td>(U) Programmable Integrated Ordnance Suite (PIOS)</td> <td align="right">750</td> <td align="right">500</td> <td align="right">0</td> </tr> <tr> <td>(U) Adaptive Flexible Structures for Air Vehicle Applications</td> <td align="right">200</td> <td align="right">0</td> <td align="right">0</td> </tr> <tr> <td>(U) Dense Metal Case Penetrating Weapon (DMCPW)</td> <td align="right">200</td> <td align="right">1,100</td> <td align="right">1,697</td> </tr> <tr> <td>(U) Strengthening of Concrete Structures for Enhanced Structural Survivability Against Conventional and Terrorist Weapons</td> <td align="right">450</td> <td align="right">550</td> <td align="right">0</td> </tr> <tr> <td>(U) Aftbody/Nozzle Aeroacoustics Program (ANAP)</td> <td align="right">0</td> <td align="right">50</td> <td align="right">0</td> </tr> <tr> <td>(U) Regional/Sector Air Operations Center (R/SAOC) Modernization Program</td> <td align="right">0</td> <td align="right">1,150</td> <td align="right">0</td> </tr> <tr> <td>(U) Cooperative Research and Development Efforts in Imaging Spectrometer Development</td> <td align="right">0</td> <td align="right">284</td> <td align="right">250</td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	(U) Image Information Reformatter (IIR)	475	400	1,200	(U) Experimental Air Operations Center (EAOC)	2,700	0	0	(U) Vista Warrior	2,742	2,300	1,000	(U) Effects of the Ionosphere on Command, Control, Communications, and Intelligence (C3I) Systems	800	500	400	(U) Future Multiband, Multiwaveform Modular Tactical Radio (FM3TR)	800	0	0	(U) Single Mode Optical Fibers for Array Imaging and for Environmental Sensing	150	150	0	(U) Free Piston Shock Tunnel/High Enthalpy Goettingen Project	500	500	200	(U) Programmable Integrated Ordnance Suite (PIOS)	750	500	0	(U) Adaptive Flexible Structures for Air Vehicle Applications	200	0	0	(U) Dense Metal Case Penetrating Weapon (DMCPW)	200	1,100	1,697	(U) Strengthening of Concrete Structures for Enhanced Structural Survivability Against Conventional and Terrorist Weapons	450	550	0	(U) Aftbody/Nozzle Aeroacoustics Program (ANAP)	0	50	0	(U) Regional/Sector Air Operations Center (R/SAOC) Modernization Program	0	1,150	0	(U) Cooperative Research and Development Efforts in Imaging Spectrometer Development	0	284	250
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>																																																											
(U) Image Information Reformatter (IIR)	475	400	1,200																																																											
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(U) Effects of the Ionosphere on Command, Control, Communications, and Intelligence (C3I) Systems	800	500	400																																																											
(U) Future Multiband, Multiwaveform Modular Tactical Radio (FM3TR)	800	0	0																																																											
(U) Single Mode Optical Fibers for Array Imaging and for Environmental Sensing	150	150	0																																																											
(U) Free Piston Shock Tunnel/High Enthalpy Goettingen Project	500	500	200																																																											
(U) Programmable Integrated Ordnance Suite (PIOS)	750	500	0																																																											
(U) Adaptive Flexible Structures for Air Vehicle Applications	200	0	0																																																											
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(U) Strengthening of Concrete Structures for Enhanced Structural Survivability Against Conventional and Terrorist Weapons	450	550	0																																																											
(U) Aftbody/Nozzle Aeroacoustics Program (ANAP)	0	50	0																																																											
(U) Regional/Sector Air Operations Center (R/SAOC) Modernization Program	0	1,150	0																																																											
(U) Cooperative Research and Development Efforts in Imaging Spectrometer Development	0	284	250																																																											
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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998	
BUDGET ACTIVITY	PE NUMBER AND TITLE		PROJECT
4 - Demonstration and Validation	0603790F NATO Cooperative Research and Development		NATO
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Effects of the Ionosphere on Communication and Surveillance Systems	0	100	100
(U) Observations and Modeling for Space Weather	0	200	200
(U) Cooperative Space Measurements	0	200	75
(U) Project Refractive Turbulence	0	180	145
(U) Metal Matrix Composites for Aerospace Applications	0	100	100
(U) Advanced Combustor Chamber Concepts Program	0	300	450
(U) Integrated Tactical Aircraft Control (ITAC) Program	0	450	400
(U) Anthropometric Accommodation in Crew Systems	0	400	400
(U) Aging Aircraft Life Prediction/Extension	0	400	400
(U) Structural Integrity of Aging Aircraft	0	350	350
(U) Airworthiness of Aging Aircraft	0	250	250
(U) Advanced Hybrid Propulsion Technologies Cooperative Research Project	0	0	750
(U) Advanced Crew Ejection Seat (ACES) II - Ejection Seat Cooperative Modification Project	0	0	1,500
(U) Air Battle Management Capabilities	0	0	1,000
(U) Air Command, Control, Communications and Intelligence Capabilities	0	0	250
(U) Total	9,767	10,414	11,117
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(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
L3 Communications Salt Lake City, UT	CPFF	Sep 95			101	0	0	0	0	101
TBD Lockheed Martin Colorado Springs, CO	CPFF	Jul 98			284	320	1,120	0	0	1,724
Logicon San Pedro, CA	CPAF	Oct 95			1,000	0	650	TBD	TBD	TBD
Boeing St Louis, MO	CPFF	Jun 94			1,000	0	0	0	0	1,000
Sytronics Dayton, OH	CPIF	May 94			1,450	650	450	0	0	2,550
Logicon San Pedro, CA	CPFF	Sep 93			2	400	400	400	400	1,202
Night Vision Corporation Lincolnwood, IL	CPFF	Jan 94			1,246	1,255	505	0	0	3,006
Boston College Boston, MA	CPFF	Jul 96			0	350	0	0	0	350
	CR	Mar 97			50	75	60	TBD	TBD	TBD
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BUDGET ACTIVITY									February 1998	
4 - Demonstration and Validation					PE NUMBER AND TITLE				PROJECT	
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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
RADEX Bedford, MA	CPFF	Mar 97				190	200	150	TBD	TBD
Pacific Sierra Research Santa Monica, CA	CPFF	Mar 97				60	0	0	TBD	TBD
CPI Fairfax, VA	CPFF	Mar 97				75	65	50	TBD	TBD
University of Massachusetts Lowell, MA	CR	Apr 97				60	60	50	TBD	TBD
KEO Consultants Brookline, MA	CPFF	Mar 97				160	75	75	TBD	TBD
Northwest Research Associates Bellevue, WA	CPFF	Apr 97				50	60	50	TBD	TBD
University of Texas Austin, TX	CPFF	May 97				25	0	0	TBD	TBD
Applied Research Lab, University of Texas Austin, TX	CPFF	May 97				40	40	40	TBD	TBD
Rome Research Corporation Rome, NY	CPFF	Oct 96				600	0	0	0	600
Motorola Scottsdale, AZ	CPFF	Aug 96				287	500	0	0	787
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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Lockheed Martin Orlando, FL	CPFF	Sep 96			150	150	50	1180	0	1,380
Raytheon TI Systems Lewisville, TX	CPFF	Dec 97			50	900	387	0	0	1,337
Waterways Experiment Station (WES) Vicksburg, MS	MIPR	Jul 97			175	225	0	0	0	400
Applied Research Associates Panama City, FL	CPAF	Aug 97			175	225	0	0	0	400
Active Control Experts, Inc Cambridge, MA	CPFF	Sep 97			200	0	0	0	0	200
Litton Data Systems Division, Agoura Hills, CA	CPAF	Mar 97					1,150	0	0	1,150
TBD UES, Inc Dayton, OH	CPFF	Jul 98					450	400	TBD	TBD
NOAA/ATDD Oak Ridge, TN	CPFF	Oct 97					100	100	0	200
Amptek, Inc Bedford, MA	MIPR	Oct 97					120	75	0	160
TBD	CPFF	Aug 96					200	75	0	275
TBD	CPFF	Aug 98					100	100	TBD	TBD
TBD	CPFF	Aug 98					100	100	TBD	TBD
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4 - Demonstration and Validation					PE NUMBER AND TITLE					PROJECT
					0603790F NATO Cooperative Research and Development					NATO
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Pratt & Whitney West Palm Beach, FL	CPFF	Jun 98					300	450	600	1,350
TBD	CPFF	May 98					400	400	TBD	TBD
TBD	CPFF	May 98					350	350	TBD	TBD
TBD	CPFF	May 98					250	250	TBD	TBD
Boeing (McDonnell Douglas) St Louis, MO	CPFF	Oct 98						284	TBD	TBD
Boeing (McDonnell Douglas) St Louis, MO	CPFF	Dec 96					50	0	0	50
TBD	CPFF	Oct 98						750	1,250	2,000
<u>Support and Management Organizations</u>										
Air Force Research Laboratory Rome, NY						90	80	80	0	250
Air Force Research Laboratory Rome, NY	AF 616	Jan 96				80	0	0	0	80
MITRE Bedford, MA	MIPR	Jan 96				300	0	0	0	300
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BUDGET ACTIVITY
4 - Demonstration and Validation

PE NUMBER AND TITLE
0603790F NATO Cooperative Research and Development

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Air Force Research Laboratory Rome, NY	AF 616	Oct 98						350	TBD	TBD
MITRE Bedford, MA	MIPR	Oct 98						100	TBD	TBD
Electronic Systems Center, MA						320	0	150	TBD	TBD
Air Force Research Laboratory WPAFB, OH						44	45	45	0	134
Air Force Research Laboratory Hanscom AFB, MA						85	20	20	TBD	TBD
CPTS/FMAP Patrick AFB, FL	AF 185	May 95				5	5	5	TBD	TBD
Air Force Research Laboratory Rome, NY						100	0	0	0	100
BMDO Rockwell Power Systems, NM	MIPR					50	50	0	0	100
	CPAF					70	70	0	0	140

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BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development			PROJECT NATO		
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Air Force Research Laboratory Kirtland AFB, NM					30	30	30	0	0	60
Air Force Research Laboratory Hanscom AFB, MA							20	30	0	85
Worcester Polytech Institute Worcester, MA	Intergovernmental Personnel Act (IPA)	Oct 97					40	40	0	80
Air Force Research Laboratory (KHILS) Eglin AFB, FL						308	0	0	0	308
Naval Air Warfare Center, CA	MIPR	May 97				115	0	0	0	115
Dynetics Fort Walton, FL	AFMC 277	Jun 97				40	0	0	0	40
Air Force Research Laboratory Tyndall AFB, FL						25	25	0	0	50
Project NATO										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE	
BUDGET ACTIVITY									February 1998	
4 - Demonstration and Validation					PE NUMBER AND TITLE				PROJECT	
					0603790F NATO Cooperative Research and Development				NATO	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Air Force Research Laboratory Eglin AFB, FL							60	38	0	98
Pender Technology, TN	CR	Oct 97					50	50	TBD	TBD
Air Force Research Laboratory WPAFB, OH	AF 616	Dec 98						650	TBD	TBD
Human Systems Center Brooks AFB, TX	MIPR	Oct 98						551	TBD	TBD
<u>Test and Evaluation Organizations</u>										
Air Force Research Laboratory Rome, NY	MIPR					100	0	0	0	100
Air Force Development Test Center, FL	PO	Jan 98					80	80	0	160
Air Force Seek Eagle Office, FL	PO	Jan 98					10	12	0	22
Air Force Research Laboratory Tyndall AFB, FL						75	75	0	0	150
Project NATO					Page 41 of 43 Pages			Exhibit R-3 (PE 0603790F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development				PROJECT NATO	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC*	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Sverdrup Technology, Inc TN	CPAF	Sep 95				353	500	200	0	1,053
Sverdrup Technology, Inc TN	CPAF	Sep 95					234	200	TBD	TBD
Holloman AFB, NM	PO	Oct 98						15	TBD	TBD

*Not applicable. NATO Cooperative R&D funds supplement as needed a project office's 6.1 through 6.5 RDT&E appropriations for initiating international cooperative R&D agreements and exploiting favorable program and technological opportunities with major allied partners.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603790F NATO Cooperative Research and Development				PROJECT NATO	
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
None									
<u>Support and Management Property</u>									
None									
<u>Test and Evaluation Property</u>									
Fora laser system	PO	Nov 97	Jan 98		147	0	0	0	147
Subtotal Product Development					7,430	9,020	8,501	Cont	Cont
Subtotal Support and Management					1,662	495	2,109	Cont	Cont
Subtotal Test and Evaluation					675	899	507	Cont	Cont
Total Project					9,767	10,414	11,117	Cont	Cont
Project NATO									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603800F Joint Strike Fighter				PROJECT 2025				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2025 Joint Strike Fighter (JSF)				251,626	432,277	456,137	239,659	22,988	0	0	0	1,567,744
Quantity of RDT&E Articles				0	0	0	4	0	0	0	0	0
<p>(U) A. <u>Mission Description and Budget Item Justification</u> The Joint Strike Fighter (JSF) Program will develop and field an affordable, highly common family of next generation strike fighter aircraft for the USN, USMC, USAF and allies. Current program emphasis is on facilitating the evolution of fully validated and affordable joint operational requirements, and demonstrating cost leveraging technologies and concepts to lower risk prior to entering Engineering and Manufacturing Demonstration (E&MD) in FY 2001. This is a joint program with no executive service. Navy and Air Force each provide approximately equal shares of annual funding for the program effective in FY 1995. The United Kingdom (UK) is a collaborative partner in this phase of the program and several other countries also participate. The Defense Advanced Research Projects Agency (DARPA) is participating in the program through FY 1998. This program is funded under DEMONSTRATION & VALIDATION because it integrates hardware for test related to specific ship or aircraft applications.</p> <p>(U) Acquisition Strategy: Concept Demonstration efforts commenced in November 1996 with competitive contract awards to Boeing and Lockheed Martin for Concept Demonstration Programs (CDP). These competing contractors will build and fly concept demonstrator aircraft, conduct concept unique ground demonstrations, and continue refinement of their ultimate delivered weapon system concepts. These efforts lead to a down-select currently scheduled for FY01 and E&MD program start. Pratt and Whitney is providing propulsion hardware and engineering support for the Weapon System Concept Demonstration efforts.</p> <p>(U) <u>FY 1997 (\$ in Thousands) (Breakout reflects Air Force, Navy, DARPA and UK):</u></p> <ul style="list-style-type: none"> - (U) \$409,727 Competitively awarded contracts to Boeing and Lockheed Martin for ground and flight demonstrations and continued concept refinement for a tri-service family of aircraft that meets the Services' needs and optimizes commonality among the variants to minimize life cycles costs (LCC); awarded contract to Pratt & Whitney for supporting propulsion efforts. - (U) \$25,000 Commenced Phase II of the Alternate Engine Program, which continued detailed design and begins hardware testing. - (U) \$152,784 Continued technology maturation demonstrations and assessments in the areas of airframe, flight systems, manufacturing and producibility, propulsion, and mission systems. Commenced systems engineering support for the Concept Demonstration Phase in the areas of system test, air vehicle analysis and integration, advanced cost estimating, survivability, integrated flight and propulsion control and carrier suitability. - (U) \$7,612 Commenced technology maturation demonstrations and assessments in the area of prognostics and health management. - (U) \$9,629 Continued technology maturation demonstrations and assessments in the area of supportability and training. - (U) \$10,191 Continued modeling and simulation activities to support strike warfare mission area analysis. - (U) \$5,196 Continued requirements analysis efforts including Cost & Operational Performance Trades (COPT) to facilitate the Services' joint requirements definition. 												
Project 2025				Page 1 of 14 Pages				Exhibit R-2 (PE 0603800F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0603800F Joint Strike Fighter	2025
<ul style="list-style-type: none"> - (U) \$13,937 Continued mission support, including program office functions; Congressionally directed OSD Force Structure Analysis. - (U) \$2,097 Anticipated DARPA general reductions. - (U) \$636,173 Total <p>(U) <u>FY 1998 (\$ in Thousands): (Breakout reflects Air Force, Navy, DARPA, UK, Multi-Lateral and Canadian funding)</u></p> <ul style="list-style-type: none"> - (U) \$696,154 Continue Concept Demonstration efforts by Boeing, Lockheed Martin and Pratt & Whitney for ground and flight demonstrations and continue concept refinement for a tri-service family of aircraft. - (U) \$29,000 Continue the Alternate Engine Program. - (U) \$181,298 Continue technology maturation demonstrations and assessments in the areas of airframe, flight systems, manufacturing and producibility, propulsion, and mission systems. Continue systems engineering support for the Concept Demonstration Phase in the areas of system test, air vehicle analysis and integration, advanced cost estimating, survivability, integrated flight and propulsion control and carrier suitability. - (U) \$14,270 Continue technology maturation demonstrations and assessments in the area of prognostics and health management. - (U) \$8,859 Continue technology maturation demonstrations and assessments in the area of supportability and training. - (U) \$10,790 Continue modeling and simulation activities to support strike warfare mission area analysis. - (U) \$9,551 Continue requirements analysis efforts including COPT to facilitate the Services' joint requirements definition. - (U) \$15,071 Continue mission support, including program office functions. - (U) \$17,128 Anticipated Services' general reductions. - (U) \$982,121 Total <p>(U) <u>FY 1999 (\$ in Thousands): (Breakout reflects Air Force, Navy, DARPA, UK, Multi-Lateral and Canadian funding)</u></p> <ul style="list-style-type: none"> - (U) \$702,484 Continue Concept Demonstration efforts by Boeing, Lockheed Martin and Pratt & Whitney for ground and flight demonstrations and continued concept refinement for a tri-service family of aircraft. - (U) \$23,000 Continue the Alternate Engine Program. - (U) \$184,995 Continue technology maturation demonstrations and assessments in the areas of airframe, flight systems, manufacturing and producibility, propulsion, and mission systems. Continue systems engineering support for the Concept Demonstration Phase in the areas of system test, air vehicle analysis and integration, advanced cost estimating, survivability, integrated flight and propulsion control and carrier suitability. - (U) \$12,467 Continue technology maturation demonstrations and assessments in the area of prognostics and health management. - (U) \$15,168 Continue technology maturation demonstrations and assessments in the area of supportability and training. - (U) \$7,591 Continue modeling and simulation activities to support strike warfare mission area analysis. - (U) \$6,984 Continue requirements analysis efforts including COPT to facilitate the Services' joint requirements definition; receive Joint Operational Requirements Document (JORD) from the Services. - (U) \$11,450 Continue mission support, including program office functions. - (U) \$964,139 Total 		
Project 2025	Page 2 of 14 Pages	Exhibit R-2 (PE 0603800F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603800F Joint Strike Fighter			PROJECT 2025
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	252,043	458,052	465,611	1,609,843
(U) Appropriated Value	263,836	458,052		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-5,541	-15,068		
b. SBIR	-6,252	-10,689		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-417			
(U) Adjustments to Budget Years Since FY 1998 PB			-9,474	
(U) Current Budget Submit/FY1999 President's Budget	251,626	432,277	456,137	1,567,744
(U) Change Summary Explanation:				
Funding:	- FY 1997: Net decrease of \$12,210 reflects \$5,541 in general congressional reductions (FY 97 Appropriations Act Section 8136 (\$5,279), Section 8138 (\$246); FFRDC (\$7) and non-FFRDC (\$9)); \$6,252 in SBIR; and a rescission of \$417 for Bosnia supplemental. - FY 1998: Net decrease of \$25,775 reflects \$15,068 in general congressional reductions (FY98 Appropriations Act Section 8043 (\$6,854), Section 8048 (\$5,716), Section 8035 (\$20), Section 8041 (\$102) and economic assumptions (\$2,493); and \$10,689 in SBIR/STRR. - FY 1999: Net decrease of \$9,474 reflects inflation adjustment (\$9,174) and Service adjustment (\$300).			
Schedule:	Not Applicable			
Technical:	Not Applicable			
Project 2025 Page 3 of 14 Pages Exhibit R-2 (PE 0603800F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603800F Joint Strike Fighter				PROJECT 2025		
(U) C.a. Other Program Funding Summary (\$ in Thousands): This is a joint program with no executive service. The United Kingdom is a full collaborative partner in this phase of the program and several other countries also participate.										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) RDT&E		243,286	449,674	463,402	244,983	26,158	0	0	0	1,635,724
	0603800N									
(U) RDT&E		70,261	22,970	0	0	0	0	0	0	122,148
	0603800E									
(U) United		71,000	55,000	34,000	26,000	0	0	0	0	200,000
	Kingdom									
(U) Multi-Lateral*		0	17,900	7,600	5,000	1,700	0	0	0	32,200
(U) Canada		0	4,300	3,000	2,700	600	0	0	0	10,600
* Netherlands, Norway and Denmark										
(U) C.b. Related Program Funding Summary (\$ in Thousands): Milestone II for E&MD of the Joint Strike Fighter (JSF) is planned in FY 2001.										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) RDT&E		0	0	0	0	546,801	1,360,213	1,854,387	TBD*	TBD*
	0604800F									
(U) RDT&E		0	0	0	0	544,381	1,360,141	1,854,358	TBD*	TBD*
	0604800N									
* TBD pending completion of December 1997 Selected Acquisition Report (SAR).										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603800F Joint Strike Fighter						PROJECT 2025			
(U) D. <u>Schedule Profile</u>														
		<u>FY 1997</u>					<u>FY 1998</u>					<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4		
(U) Competitively awarded Concept Demonstration Contracts to Boeing and Lockheed Martin -- Nov 1996	X													
(U) Initial Design Review -- Sep 1997				X										
(U) JIRD III approval -- Oct 1999									X					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603800F Joint Strike Fighter		PROJECT 2025
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
Project Cost Categories:	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) a. Weapon System Concept Demonstrations Contracts (including flying demonstrations)	409,727	696,154	702,484
(U) b. Alternate Engine Program	25,000	29,000	23,000
(U) c. Technology Maturation and Systems Engineering Support Total	152,784	181,298	184,995
Breakout:			
<u>Technology Maturation</u>			
Airframe	8,370	1,509	1,200
Flight Systems	38,445	29,912	26,790
Manufacturing & Producibility	6,577	4,610	5,134
Propulsion	23,605	32,159	6,319
Mission Systems	37,025	59,558	99,050
Subtotal - Technology Maturation	114,022	127,748	138,493
Plus: Systems Engineering Support	38,762	53,550	46,502
(U) d. Prognostics and Health Management	7,612	14,270	12,467
(U) e. Supportability and Training	9,629	8,859	15,168
(U) f. Requirements Total:	15,387	20,341	14,575
Breakout:			
Modeling and Simulation	10,191	10,790	7,591
Analysis, Threat/Intelligence, Cost & Operational Performance Trades and Core Team Support	5,196	9,551	6,984
Project 2025	Page 6 of 14 Pages	Exhibit R-3 (PE 0603800F)	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	
BUDGET ACTIVITY		PE NUMBER AND TITLE	
4 - Demonstration and Validation		0603800F Joint Strike Fighter	
		PROJECT	
		2025	
Project Cost Categories:	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) g. Mission Support	13,937	15,071	11,450
(U) h. Services' General Reductions	2,097	17,128	0
(U) Total	636,173	982,566	964,139
Funding Resources:			
0603800F	251,626	432,277	456,137
0603800N	243,286	449,674	463,402
0603800E	70,261	22,970	0
United Kingdom	71,000	55,000	34,000
Multi-Lateral	0	17,900	7,600
Canada	0	4,300	3,000
(U) Total	636,173	982,121	964,139

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603800F Joint Strike Fighter			PROJECT 2025			
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands) No budget in FY 1993 and Prior.										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/ Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Product Development:										
<u>Strike Warfare Concept Studies (Total Prior to FY 1997)</u>										
Miscellaneous	Various	Oct93 - Sep94	11,467	11,467	11,467					11,467
<u>Technology Maturation Concept Exploration Phase (Total Prior to FY 1997)</u>										
Fld. Act.	Various	Oct93 - Sep94	3,432	3,432	3,432					3,432
<u>Strike Warfare Systems Design Development (Total Prior to FY 1997)</u>										
Boeing Seattle WA	C/CPFF	Dec 94	32,770	32,770	32,770					32,770
McAir St. Louis MO	C/CPFF	Dec 94	23,708	23,708	23,708					23,708
Northrop Pico Rivera CA	C/CPFF	Dec 94	21,358	21,358	21,358					21,358
Lockheed Fort Worth, TX	C/CPFF	Dec 94	28,311	28,311	28,311					28,311
Miscellaneous Fld. Activ.	Various	Various Oct95-Sep96	1,121	1,121	1,121					1,121
	Various		8,322	8,322	8,322					8,322
SUBTOTAL			115,590	115,590	115,590					115,590
Project 2025			Page 8 of 14 Pages				Exhibit R-3 (PE 0603800F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603800F Joint Strike Fighter			PROJECT 2025		
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/ Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>ASTOVL (Total Prior to FY 1997)</u>										
Lockheed	SS/CPFF	Oct 94	16,416	16,416	16,416					16,416
Boeing	SS/CPFF	Jan 95	11,200	11,200	11,200					11,200
Miscellaneous	Various	Various	15,539	15,539	15,539					15,539
SUBTOTAL			43,155	43,155	43,155					43,155
<u>Core Team Support (Total Prior to FY 1997)</u>										
Fld. Activ.	Various	Oct 96- Sep 97	2,522	2,522	2,522					2,522
<u>Weapon System Concept Demonstrations (including flying demonstrators and supporting propulsion efforts)</u>										
Boeing	C/CPFF	Nov 96	649,802	649,802		72,208	182,827	238,684	156,083	649,802
Lockheed	C/CPFF	Nov 96	706,800	706,800		105,900	203,200	246,900	150,800	706,800
Pratt & Whitney West Palm Beach FL	SS/CPAF	Nov 96	832,046	832,046		231,619	310,127	216,900	73,400	832,046
SUBTOTAL			2,188,648	2,188,648		409,727	696,154	702,484	380,283	2,188,648
*includes government managed equipment										
<u>Alternative Engine Program</u>										
GE	SS/CPFF	Nov 95	114,000	114,000	7,000	25,000	29,000	23,000	30,000	114,000
<u>Technology Maturation</u>										
<u>Airframe</u>										
McAir	SS/CPFF	Dec 94	19,240	19,240	12,100	7,140				19,240
Miscellaneous	Various	Various	2,485	2,485	1,861	24	100	500		2,485
Fld. Activ.	Various	Oct98- Sep99	5,603	5,603	1,788	1,106	1,409	700	600	5,603
SUBTOTAL			27,328	27,328	15,749	8,270	1,509	1,200	600	27,328

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603800F Joint Strike Fighter				PROJECT 2025	
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/ Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Flight Systems</u>										
Lockheed	C/CPFF	Dec 94	51,227	51,227	15,296	16,088	10,029	7,708	2,106	51,227
McAir	C/CPFF	Dec 94	65,426	65,426	14,701	16,900	15,200	13,400	5,225	65,426
Miscellaneous	Various	Various	9,801	9,801	6,898	1,535	657	400	311	9,801
Fld. Activ.	Various	Oct98- Sep99	19,568	19,568	5,926	3,872	3,938	5,162	670	19,568
SUBTOTAL			146,022	146,022	42,821	38,395	29,824	26,670	8,312	146,022
<u>Manufacturing & Producibility</u>										
Hughes Los Angeles CA	C/CPFF	Dec 94	5,065	5,065	3,035	2,030				5,065
Lockheed General Res. Corp.	C/CPFF	Dec 94	11,190	11,190	2,897	1,836	2,767	2,890	800	11,190
Huntsville AL	C/CPFF	Dec 94	1,945	1,945	1,945					1,945
Scaled Comp	C/CPFF	Jun 97	2,000	2,000		2,000				2,000
Miscellaneous	Various	Various	3,138	3,138	830	178	1,035	1,095		3,138
Fld. Activ.	Various	Oct98- Sep99	5,915	5,915	1,925	533	808	1,149	1,500	5,915
SUBTOTAL			29,253	29,253	10,632	6,577	4,610	5,134	2,300	29,253
<u>Propulsion</u>										
Pratt/Whitney	C/CPFF	Dec 94	5,448	5,448	5,448					5,448
GE Cincinnati OH	SS/CPFF	Dec 94	5,681	5,681	5,681					5,681
Pratt/Whitney	SS/CPFF	Nov 95	30,000	30,000	30,000					30,000
Pratt/Whitney	SS/CPFF	Feb 97	29,787	29,787		13,859	13,009	2,919		29,787
Pratt/Whitney	SS/CPFF	Mar 97	3,640	3,640		3,640				3,640
Pratt/Whitney	SS/TBD	Dec 97	9,200	9,200		2,400	5,600	1,200		9,200
Miscellaneous	Various	Various	12,895	12,895	12,895					12,895

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BUDGET ACTIVITY					PE NUMBER AND TITLE					
4 - Demonstration and Validation					0603800F Joint Strike Fighter					
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/ Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Fld. Activ.	Various	Oct98- Sep99	21,670	21,670	2,214	3,706	13,550	2,200	0	21,670
SUBTOTAL			118,321	118,321	56,238	23,605	32,159	6,319	0	118,321
<u>Mission Systems</u>										
TI Plano TX	C/CPFF	Dec 94	2,464	2,464	2,464					2,464
Lockheed	SS/CPFF	Dec 95	6,856	6,856	3,006	2,250	1,600			6,856
McAir	SS/CPFF	Dec 95	6,524	6,524	2,674	2,250	1,600			6,524
Hughes	C/CPFF	Dec 95	54,637	54,637	5,153	8,619	13,502	23,832	3,531	54,637
Westinghouse Baltimore MD	C/CPFF	Dec 95	49,998	49,998	4,788	7,660	13,498	20,522	3,530	49,998
Boeing	C/CPFF	Mar 96	33,024	33,024	300	3,874	11,000	16,700	1,150	33,024
Lockheed	C/CPFF	Mar 96	32,993	32,993	300	3,843	11,000	16,700	1,150	32,993
New Contract	C/CPFF	Jan 98	19,599	19,599			2,200	5,000	12,399	19,599
New Contract	C/CPFF	Dec 98	12,800	12,800				8,400	4,400	12,800
New Contract	C/CPFF	Dec 98	5,300	5,300				1,000	4,300	5,300
Hughes	C/CPFF	Dec 94	3,681	3,681	2,628	1,053				3,681
Miscellaneous	Various	Various	20,097	20,097	18,853	930	314			20,097
Fld. Activ.	Various	Oct98- Sep99	33,551	33,551	10,982	6,546	4,557	6,596	4,870	33,551
SUBTOTAL			281,524	281,524	51,148	37,025	59,271	98,750	35,330	281,524
<u>Systems Engineering Spt</u>										
Miscellaneous	Various	Various	16,423	16,423		4,780	4,923	3,020	3,700	16,423

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603800F Joint Strike Fighter				PROJECT 2025	
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/ Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Fld. Activ.	Various	Oct98- Sep99	173,205	173,205		33,578	48,177	42,982	48,468	173,205
SUBTOTAL			189,628	189,628		38,358	53,100	46,002	52,168	189,628
<u>Prognostics and Health Management</u>										
Boeing	C/CPFF	Jun 97	11,100	11,100		750	3,700	3,750	2,900	11,100
Lockheed	C/CPFF	Apr 97	13,100	13,100		2,050	3,000	5,350	2,700	13,100
Pratt/Whitney	C/CPFF	Jun 97	10,100	10,100		3,920	6,180	0	0	10,100
General Electric	C/CPFF	Mar 98	3,067	3,067		0	200	2,617	250	3,067
Miscellaneous	Various	Various	2,099	2,099		559	990	550	0	2,099
Fld. Activ.	Various	Oct98- Sep99	933	933		333	200	200	200	933
SUBTOTAL			40,399	40,399		7,612	14,270	12,467	6,050	40,399
<u>Supportability and Training</u>										
Classified										
Project 3	C/CPFF	Dec 94	13,037	13,037	2,262	3,000	3,250	1,675	2,850	13,037
Project 4	C/CPFF	Dec 94	9,324	9,324	1,038	2,525	1,236	1,675	2,850	9,324
Boeing	C/CPFF	Jun 97	3,875	3,875		1,000	1,375	1,500		3,875
Lockheed	C/CPFF	Jun 97	3,875	3,875		1,000	1,375	1,500		3,875
New Contract	C/CPFF	Jan 99	28,141	28,141				7,618	20,523	28,141
Miscellaneous	Various	Various	2,271	2,271	2,127	144				2,271
Fld. Activ.	Various	Oct98- Sep99	10,317	10,317	3,044	1,940	1,598	1,170	2,565	10,317
SUBTOTAL			70,840	70,840	8,471	9,609	8,834	15,138	28,788	70,840
<u>Modeling and Simulation</u>										
Project 2025										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603800F Joint Strike Fighter				PROJECT 2025	
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/ Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Miscellaneous Fld. Activ.	Various Various	Various Oct98- Sep99	32,576 9,114	32,576 9,114	4,341 1,807	6,541 3,160	9,137 1,403	6,269 1,072	6,288 1,672	32,576 9,114
SUBTOTAL			41,690	41,690	6,148	9,701	10,540	7,341	7,960	41,690
<u>Analysis, Threat, COPT and Core Support</u>										
Miscellaneous Fld. Activ.	Various Various	Various Oct98- Sep99	25,104 16,949	25,104 16,949	7,298 8,794	3,918 1,048	6,551 2,770	4,620 2,114	2,717 2,223	25,104 16,949
SUBTOTAL			42,053	42,053	16,092	4,966	9,321	6,734	4,940	42,053
<u>Mission Support</u>										
Institute for Defense Anal Fld. Activ.	Grant Various	Jan 97 Oct98- Sep99	2,500 29,059	2,500 29,059	0 7,896	2,500 4,429	0 7,016	0 4,578	0 5,140	2,500 29,059
SUBTOTAL			32,004	32,004	7,896	6,929	7,016	4,578	5,140	31,559
Support and Management Organizations (CS):										
ANSER Arlington VA	SS/CPFF	Apr 94	19,042	19,042	9,793	5,028	4,221			19,042
New Contract	C/CPFF	Feb 00	6,952	6,952	0	0	0	3,721	3,231	6,952
Miscellaneous	Various	Various	25,766	25,766	8,041	3,274	5,164	4,601	4,686	25,766
SUBTOTAL			51,760	51,760	17,834	8,302	9,385	8,322	7,917	51,760
<u>Test and Evaluation Organizations: (Included Above)</u>										
<u>Government Furnished Property: N/A</u>										
Project 2025					Page 13 of 14 Pages			Exhibit R-3 (PE 0603800F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603800F Joint Strike Fighter	PROJECT 2025
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	Total Prior to <u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
Subtotal Product Development	398,361	625,774	955,608	955,817	561,871	3,497,431
Subtotal Support and Management	17,834	8,302	9,385	8,322	7,917	51,760
Services' General Reductions	0	2,097	17,128	0	0	19,225
Subtotal Test and Evaluation	0	0	0	0	0	0
Total Project	416,195	636,173	982,121	964,139	569,788	3,568,416

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	45,961	46,372	29,360	34,149	47,487	45,519	49,121	Continuing	Continuing
1020 ICBM Guidance Applications	15,775	16,061	13,278	15,345	21,619	18,722	20,862	Continuing	Continuing
1021 ICBM Propulsion Applications	183	181	185	184	181	1,714	1,696	Continuing	Continuing
1022 ICBM Reentry Vehicle Applications	9,639	12,444	13,382	16,173	23,153	22,163	23,672	Continuing	Continuing
1023 Rocket System Launch Program (RSLP) Applications	17,220	15,202	31	33	35	33	34	Continuing	Continuing
1024 ICBM Command & Control (C2) Applications	1,051	181	185	184	181	451	447	Continuing	Continuing
4209 Long Range Planning (LRP)	2,093	2,303	2,299	2,230	2,318	2,436	2,410	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

(U) Efforts identify methods to reduce life cycle costs, improve nuclear safety and surety, support international arms control agreements and disengagement strategies, and ensure continued ICBM viability. Program includes demonstration and validation projects for ICBM guidance options, to support reentry vehicles beyond original design life, to provide an assessment of current and future ICBM propulsion systems, and develop enhancements to ensure command and control capabilities.

(U) This program is in Budget Activity 4 - Demonstration and Validation because the projects are demonstrating the general military utility and/or cost reduction potential of advanced technologies.

(U) Acquisition Strategy:

(U) The ICBM System Program Office (SPO) awarded a Prime Integration Contract (PIC) to TRW on 22 Dec 97. It is anticipated all future engineering services, modification, and replacement programs will be accomplished under this contract.

(U) Studies and analyses as well as limited engineering and pre-prototype hardware development may be accomplished. All future efforts will be conducted under the ICBM PIC unless other strategies are deemed more appropriate.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val
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(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	46,037	32,837	31,951	Continuing
(U) Appropriated Value	48,344	49,337		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-1,062	-1,805		
b. SBIR	-1,245	-1,160		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-76			
(U) Adjustments to Budget Years Since FY 1998 PB			-2591	
(U) Current Budget Submit/FY 1999 President's Budget	45,961	46,372	29,360	Continuing

(U) Change Summary Explanation: See individual projects.

(U) **C. Other Program Funding Summary (\$ in Thousands):** None.

(U) **D. Schedule Profile:** See individual projects.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603851F ICBM Dem/Val				PROJECT 1020	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1020 ICBM Guidance Applications	15,775	16,061	13,278	15,345	21,619	18,722	20,862	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) ICBM Guidance Application efforts implement the JROC-validated Mission Need Statement for Future Guidance Systems for Intercontinental Ballistic Missiles. The program focuses on disengagement strategies, significantly reducing guidance system life cycle cost, increasing nuclear surety, and evaluating/demonstrating the guidance instrument options that will keep ICBMs viable. This program also implements the Nuclear Posture Review recommendations to preserve guidance instrument technologies. The guidance applications project will demonstrate the utility and/or cost reduction potential of technologies applied to ICBM guidance systems, including future requirements.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,300 Developed Gyro Stabilized Platform acquisition documents. - (U) \$1,311 Continued integration assessment of advanced inertial measurement unit (IMU) design into Minuteman weapon system. - (U) \$8,379 Began advanced IMU concept prototype sled testing and evaluation. - (U) \$3,280 Conducted advanced instrument prototype integration tests. - (U) \$1,505 Continued radiation hardened parts design options study and implementation of results. - (U) \$15,775 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$290 Continue development of Gyro Stabilized Platform acquisition documentation. - (U) \$7,695 Continue integration assessment of advanced inertial measurement unit (IMU) design into Minuteman weapon system. - (U) \$2,858 Continue advanced IMU concept prototype sled test and evaluate results. - (U) \$2,918 Continue advanced instrument prototype integration tests. - (U) \$2,300 Continue radiation hardened parts efforts. - (U) \$16,061 Total 									
Project 1020			Page 3 of 27 Pages			Exhibit R-2 (PE 0603851F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																												
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1020																																																												
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,050 Continue integration studies of advanced systems concepts into Minuteman weapon system. - (U) \$7,228 Conduct design, test, and integration of advanced instruments. - (U) \$3,000 Continue radiation hardened parts efforts. - (U) \$13,278 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">15,233</td> <td style="text-align: right;">16,834</td> <td style="text-align: right;">14,545</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">15,998</td> <td style="text-align: right;">16,834</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Gen Reductions</td> <td style="text-align: right;">-363</td> <td style="text-align: right;">-576</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-402</td> <td style="text-align: right;">-197</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">f. Other</td> <td style="text-align: right;">542</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-1,267</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">15,775</td> <td style="text-align: right;">16,061</td> <td style="text-align: right;">13,278</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: FY99 includes offset reduction to fund other AF and DoD priorities. FY97 funding adjustment reflects \$542 transferred from Rocket Systems Launch Program Applications (BPAC 1023, this PE) to pay for congressional reductions erroneously assessed against this BPAC.</p> <p style="padding-left: 40px;">Schedule: Selected FY99 studies/analyses, such as advanced IMU assessment, will be deferred until FY01.</p> <p style="padding-left: 40px;">Technical: No significant impact.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> None.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	15,233	16,834	14,545	Continuing	(U) Appropriated Value	15,998	16,834			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions	-363	-576			b. SBIR	-402	-197			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions					f. Other	542				(U) Adjustments to Budget Years Since FY 1998 PB			-1,267		(U) Current Budget Submit/FY 1999 President's Budget	15,775	16,061	13,278	Continuing
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																										
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(U) Adjustments to Budget Years Since FY 1998 PB			-1,267																																																											
(U) Current Budget Submit/FY 1999 President's Budget	15,775	16,061	13,278	Continuing																																																										
Project 1020	Page 4 of 27 Pages	Exhibit R-2 (PE 0603851F)																																																												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603851F ICBM Dem/Val			PROJECT 1020		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Program Management Support					285	280	290			
(U) Contract Systems Engineering					15,490	15,781	12,988			
(U) Total					15,775	16,061	13,278			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
TRW (Prime)	C/CPAF	Dec 97	Continuing	Continuing			8,529	11,955	Continuing	Continuing
Litton	C/CPAF	Aug 91	18,500	18,500	9,283	7,165	1,971	0	0	18,419
Lockheed-Martin	C/CPAF	Aug 91	4,200	4,200	4,136					4,136
Draper Labs	C/CPAF/FFP	Nov 91	8,100	8,100	2,065	4,165	1,801			8,031
<u>Support and Management Organizations</u>										
TRW	SS/CPAF	Oct 95	1,611	1,611	1,297	235	79		0	1,611
Other Engineering Support	Various	Various	Continuing	Continuing	5,167	3,355	562	290	Continuing	Continuing
<u>Test and Evaluation Organizations</u>										
Phillips Lab	MIPR	Annual	Continuing	Continuing	0	155	2,300	744	Continuing	Continuing
Central Inertial Guidance Test Facility	PO	Annual	1,359	1,359	790	500	69	0	0	1,359
Navy SSP	MIPR	Aug 97	977	977	0	0	750	227	0	977
Project 1020					Page 6 of 27 Pages			Exhibit R-3 (PE 0603851F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603851F ICBM Dem/Val				PROJECT 1020	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
Wright Labs	MIPR	Jan 97	262	262	0	200	0	62	0	262
Government Furnished Property: None					Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
Subtotal Product Development					15,484	11,330	12,301	11,955	Continuing	Continuing
Subtotal Support and Management					6,464	3,590	641	290	Continuing	Continuing
Subtotal Test and Evaluation					790	855	3,119	1,033	Continuing	Continuing
Total Project					22,738	15,775	16,061	13,278	Continuing	Continuing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603851F ICBM Dem/Val				PROJECT 1021	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1021 ICBM Propulsion Applications	183	181	185	184	181	1,714	1,696	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) This applications project explores alternatives and improvements to the current ICBM propulsion systems capability and studies to assess future ICBM missile propulsion requirements. Fired Propulsion System Rocket Engine (PSRE) component reuse studies will also be accomplished.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$183 Continued fired PSRE reuse study on components such as relief valves. (Only task.) - (U) \$183 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$181 Conduct All Ordnance Destruct System capability study. (Only task.) - (U) \$181 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$185 Conduct propulsion cost and performance studies for Ballistic Missile Replacement design concepts. (Only task.) - (U) \$185 Total 									
Project 1021			<i>Page 8 of 27 Pages</i>			Exhibit R-2 (PE 0603851F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1021
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	183	192	189	Continuing
(U) Appropriated Value	191	192		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-4	-6		
b. SBIR	-4	-5		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-4	
(U) Current Budget Submit/FY 1999 President's Budget	183	181	185	Continuing

(U) Change Summary Explanation:

Funding: No significant changes.
 Schedule: No significant impact.
 Technical: No significant impact.

(U) C. Other Program Funding Summary (\$ in Thousands): None.

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Complete PSRE Reuse Studies				X*								
(U) Start/Complete Ordnance Studies					X				X			
(U) Start/Complete Cost/Perf Studies												X

* Started and/or Completed

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603851F ICBM Dem/Val				PROJECT 1021	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Contract Engineering Support					169	172	177			
(U) Program Management Support					14	9	8			
(U) Total					183	181	185			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
TRW (Prime)	C/CPAF	Dec 97	Continuing	Continuing	361	169	172	177	Continuing	Continuing
<u>Support and Management Organizations</u>										
Various	Various	Ongoing	Continuing	Continuing	35	14	9	8	Continuing	Continuing
<u>Test and Evaluation Organizations</u>										
None										
Government Furnished Property: None										
					<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development					361	169	172	177	Continuing	Continuing
Subtotal Support and Management					35	14	9	8	Continuing	Continuing
Subtotal Test and Evaluation										
Total Project					396	183	181	185	Continuing	Continuing
Project 1021					Page 10 of 27 Pages				Exhibit R-3 (PE 0603851F)	

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1022
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1022 ICBM Reentry Vehicle Applications	9,639	12,444	13,382	16,173	23,153	22,163	23,672	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) ICBM Reentry Vehicle (RV) Applications efforts are required to support a Minuteman force of 500 missiles, arms control treaties/initiatives directing the Minuteman force be downloaded to a single RV configuration, the need to ensure Minuteman force contains the safest, most reliable RV, and CINCSTRATCOM guidance that we should continue to ensure the continuing readiness for our strategic deterrent. ICBM RV Applications efforts will support RVs beyond their original design life through addressing problems with operational reentry systems, meeting real on-going needs, and ensuring the availability of long-lead components/materials. This project will develop methods to better predict aging phenomena, and identify life cycle cost reduction methods. Additionally, these efforts will maintain a minimum level of technical engineers and capability to respond to aging phenomena and future requirements including transition to force applications to comply with evolving Air Force global engagement strategy/vision. RV work conducted under this program will leverage the Science & Technology community and coordinate with Navy RV efforts to eliminate duplication and realize synergistic cost savings.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,624 Continued to evaluate existing RV material subsystems and potential material replacements by performing applicable ground and flight tests.
- (U) \$1,385 Designed, developed, and conducted prototype testing of selected aging prediction techniques and tools.
- (U) \$1,781 Designed, developed, and conducted prototype testing of selected fuze assessment/measurement methodologies.
- (U) \$1,583 Designed, developed, and conducted prototype testing of selected sensors/instruments.
- (U) \$480 Identified and ground tested potential replacement options for critical RV components.
- (U) \$1,286 Conducted initial evaluation of improved accuracy assessment measurement methodology.
- (U) \$500 Completed necessary Safety Enhanced Reentry Vehicle (SERV) acquisition documentation and conducted Phase I activities.
- (U) \$9,639 Total

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1022
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(U) FY 1998 (\$ in Thousands):

- (U) \$3,724 Continue to evaluate existing RV material subsystems and potential material replacements by performing applicable ground and flight tests.
- (U) \$1,660 Continue to design, develop, and conduct prototype testing of selected aging prediction techniques and tools.
- (U) \$2,550 Continue to design, develop, and conduct prototype testing of selected fuze assessment/measurement methodologies.
- (U) \$2,440 Continue to design, develop, and conduct prototype testing of selected sensors/instruments.
- (U) \$530 Continue identifying and ground testing of potential replacement options for critical RV components.
- (U) \$1,540 Continue evaluation of improved accuracy assessment measurement methodology.
- (U) \$12,444 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$4,201 Continue to evaluate existing RV material subsystems and potential material replacements by performing applicable ground and flight tests.
- (U) \$2,023 Evaluate force applications technologies to comply with evolving AF global studies.
- (U) \$2,534 Continue design, develop, and conduct prototype testing of selected fuze assessment/measurement methodologies.
- (U) \$2,712 Continue design, develop, and conduct prototype testing of selected sensors/instruments.
- (U) \$692 Continue identifying and ground testing of potential replacement options for critical RV components.
- (U) \$1,220 Continue evaluation of improved accuracy assessment measurement methodology.
- (U) \$13,382 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	9,639	13,123	14,651	Continuing
(U) Appropriated Value	10,123	13,123		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-228	-573		
b. SBIR	-256	-106		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-1,269	
(U) Current Budget Submit/FY 1999 President's Budget	9,639	12,444	13,382	Continuing

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BUDGET ACTIVITY 4 - Demonstration and Validation	0603851F ICBM Dem/Val	1022
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(U) Change Summary Explanation:

Funding: FY99 funding reduction to fund other AF and DoD priorities.

Schedule: Selected studies/analyses will be deferred until FY01, such as the planned RV Recovery task.

Technical: No significant impact.

(U) **C. Other Program Funding Summary (\$ in Thousands):** None.

(U) **D. Schedule Profile**

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Complete SERV Acquisition Docs				X*								
(U) Continue Evaluation of Materials; Identify Replacements												
Complete Ground/Flight Tests												X
Design/Develop/Test of Selected Technologies	X*											X
(U) Aging Prediction Methodologies												
Design/Develop/Test of Selected Technologies												On-Going
(U) Sensor/Instrumentation Integration												
Design/Develop/Test of Sensors & Instruments												On-Going
(U) Assessment Methodology												
Evaluation of Accuracy Measurement Techniques												On-Going
(U) Fuze Assessment												
Design/Develop/Test of Measurement Tools												On-Going
(U) Critical Components												
Design/Develop/Test of Replacement Options												On-Going
(U) Force Application Evaluations - Identify/Evaluate Options									X			On-Going
* Started and/or Completed												

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1022
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(U) A. _____

<u>FY 1997</u>	_____	<u>FY 1999</u>
9,390		12,836
249		546
9,639		13,382

Budget Acquisition History and Planning Information (\$ in Thousands)

Contractor or Performing _____	Contract or Funding _____	Award or Date <u>Date</u>	Activity _____	Project EAC <u>EAC</u>	Prior to _____	Budget _____	<u>FY 1998</u> _____	Budget to _____	Total _____
<u>Product Development Organizations</u>									
	C/CPAF		Continuing		1,826		3,970	Continuing	
Lockheed-Martin		Various	Continuing	Continuing		4,550		5,380	Continuing
American		Various	Continuing	Continuing		0		3,128	Continuing
TRW		Oct 95		2,800		1,201		0	2,733
	C/CPAF		Continuing		0		364	Continuing	
Other Engineering &	Various		Continuing		269		1,534	Continuing	
<u>Test and Evaluation Organizations</u>									
AEDC	MIPR	n/a	Continuing	300	406	270	85	350	Continuing

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1022
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Government Furnished Property: None.

	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development	5,448	7,390	9,880	12,018	Continuing	Continuing
Subtotal Support and Management	1,565	1,899	2,134	934	Continuing	Continuing
Subtotal Test and Evaluation	706	350	430	430	Continuing	Continuing
Total Project	7,719	9,639	12,444	13,382	Continuing	Continuing

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1023
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1023 Rocket System Launch Program (RSLP) Applications	17,220	15,202	31	33	35	33	34	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) This task supports studies/analysis on hardware for cost effective use on excess missile assets.

(U) FY 1997 (\$ in Thousands):

- (U) \$31 Continued studies/analyses for the adoption of low cost front-end systems for use on deactivated missile assets.
- (U) \$458 Initiated studies/analyses to support storage of excess Peacekeeper-unique handling equipment.
- (U) \$2,000 Developed GPS range safety modifications.
- (U) \$14,731 Developed improved accuracy capabilities for conventional ICBM precision strike.
- (U) \$17,220 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$31 Continue study/analysis for the adoption of low cost front-end systems for use on deactivated missile assets.
- (U) \$14,850 Develop capabilities for Conventional Ballistic Missile (CBM) precision delivery Advanced Concept Technology Demonstration (ACTD) Program.
- (U) \$321 Pending reprogramming to fund higher priorities.
- (U) \$15,202 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$31 Continue study/analysis for the adoption of low cost front-end systems for use on deactivated missile assets. (One task only)
- (U) \$31 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val			PROJECT 1023
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	17,838	31	32	Continuing
(U) Appropriated Value	18,731	16,531		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-394	-539		
b. SBIR	-499	-790		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescission	-166			
f. Other	-452			
(U) Adjustments to Budget Years Since FY 1998 PB			-1	
(U) Current Budget Submit/FY 1999 President's Budget	17,220	15,202	31	Continuing
(U) Change Summary Explanation (\$ in thousands):				
Funding: Congress added \$16,500 to FY98 request to establish a Conventional Ballistic Missile (CBM) Advanced Concept Technology Demonstration. FY97 funding adjustments include \$452 transferred to Guidance Applications (BPAC 1020, this PE) to pay for congressional reductions erroneously assessed against that BPAC. Other reductions to offset higher Air Force and DoD needs.				
Schedule: No significant impact.				
Technical: Initiated a CBM ACTD program in FY98 per congressional direction.				

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1023
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(U) C. Other Program Funding Summary (\$ in Thousands): None.

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Start/Complete Annual Multiservice Launch System Applications Studies/Analysis	X*			X*	X*			X	X			X
(U) Start/Complete Handling Equipment Analysis	X*			X*								
(U) GPS Range Safety & Improved Accuracy Analysis		X*	X*	X*	X*	X	X	X	X	X		

* Started and/or Completed

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603851F ICBM Dem/Val			PROJECT 1023		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Studies/Analysis					489	31	31			
(U) GPS Range Safety/Improved Accuracy					16,731	14,850				
(U) Other - Pending Reprogramming						321				
(U) Total					17,220	15,202	31			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Textron	C/CPFF	30 Apr 97	4,900	4,900	0	4,900				4,900
TBD	C/CPIF	Feb 98	TBD	3,000	0	3,000				3,000
TBD	C/CPIF	Mar 98	TBD				12,100			12,100
Phillips Lab	MIPR	30 Mar 97	3,004	3,004	0	2,504	500			3,004
Wright Lab	MIPR	30 Mar 97	900	900	0	900				900
National Guard (FL)	MIPR	1 Jul 97	2,500	2,500	0	2,500				2,500
Various	Various	Various	Continuing	Continuing	0	700	450		Continuing	Continuing
<u>Support and Management Organizations</u>										
TRW/SETA	SS/T&M	15 Mar 97	1,527	1,527	0	1,527	1,800			3,327
Various	Various	Ongoing	Continuing	Continuing	28	489	31	31	Continuing	Continuing
Other - Pending Reprogramming							321			321
<u>Test and Evaluation Organizations</u>										
AEDC	MIPR	Feb 98	700	700	0	700				700

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1023
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Government Furnished Property: None.

	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development	0	14,504	13,050	0	Continuing	Continuing
Subtotal Support and Management	28	2,016	2,152	31	Continuing	Continuing
Subtotal Test and Evaluation	0	700	0	0	0	700
Total Project	28	17,220	15,202	31	Continuing	Continuing

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BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603851F ICBM Dem/Val				PROJECT 1024				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1024	ICBM Command & Control (C2) Applications			1,051	181	185	184	181	451	447	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

(U) The deMIRVing of ICBMs and overall cutbacks in the number of nuclear weapons reduce the incentive to attack individual ICBM silos. Therefore, the incentive to attack Minuteman launch control centers will increase unless steps are taken to lessen an aggressor's confidence in being able to prevent missile launch by simultaneously destroying all launch control centers. This program funds efforts to identify existing technologies (Ground Launch Cruise Missile, Small ICBM, Airborne Launch Control Centers, etc.) to increase the uncertainty of destroying Minuteman launch control center capabilities. The identification and use of existing military hardware, software, and system designs/documentation are principle concerns. Additionally, it is critical to explore ways of continuing assured connectivity to strategic forces. Study efforts will be conducted to ensure reliable and standardized communication links are maintained between the ICBM forces and higher authorities. Testing of existing low cost technology (fiber optic cable, telescoping antennas, etc.) under heightened states of alert of both simulated and actual readiness scenarios will be conducted. Methods to further disengagement strategies and achieve additional cost savings will also be pursued.

(U) FY 1997 (\$ in Thousands):

- (U) \$173 Completed EHF studies to include identifying a single terminal option and a cost analysis.
- (U) \$878 Identified technical and cost options for providing future command, control, communications, and computer (C4) elements and alternatives [e.g., Defense Improved Emergency Message Automated Transmission System (IEMATS) Replacement Command and Control Terminal (DIRECT) Program].
- (U) \$1,051 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$181 Examine Strategic Automated Command and Control System (SACCS) and other ICBM command, control, and communication (C3) systems for turn-of-the-century (i.e., treaty) implications. (Only task.)
- (U) \$181 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$185 Accomplish analysis for the Fiber Optic Link/Hardened Intersite Cable System (HICS) upgrade. (Only task.)
- (U) \$185 Total

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 1024
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	1,051	192	189	Continuing
(U) Appropriated Value	1,103	192		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-23	-6		
b. SBIR	-29	-5		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescission				
(U) Adjustments to Budget Years Since FY 1998 PB			-4	
(U) Current Budget Submit/FY 1999 President's Budget	1,051	181	185	Continuing

(U) Change Summary Explanation:

Funding: No significant changes.
 Schedule: No significant impact.
 Technical: No significant impact.

(U) C. Other Program Funding Summary (\$ in Thousands): None.

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Complete Milstar EHF		X*										
(U) Fiber optic link/HICS Upgrade									X			X
(U) Future C4 Study & Analysis	X*			X*								
(U) SACCS/Turn-of-Century Study & Analysis				X*				X				

* Started and/or Completed

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603851F ICBM Dem/Val				PROJECT 1024	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Contract Engineering Support					1,042	174	181			
(U) Program Management					9	7	4			
(U) Total					1,051	181	185			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
<u>Support and Management Organizations</u>										
Various	Various	Ongoing	n/a	n/a	496	173	0	0	0	669
GTE	SS/CPAF		878	878		878				878
TRW (Prime)	C/CPAF	Dec 97	n/a	n/a	0	0	181	185	Continuing	Continuing
<u>Test and Evaluation Organizations</u>										
None										
Government Furnished Property: None.										
					<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development										
Subtotal Support and Management					496	1,051	181	185	Continuing	Continuing
Subtotal Test and Evaluation										
Total Project					496	1,051	181	185	Continuing	Continuing
Project 1024					Page 23 of 27 Pages			Exhibit R-3 (PE 0603851F)		

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 4209
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COST (\$ In Thousands)	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	Cost to	Total Cost
Long Range Planning (LRP)		2,303		2,230		2,436		Continuing	

(U) A. _____

(U) The Long Range Planning (LRP) task analyzes ICBM systems to identify potential modifications required to meet user objectives relative to long term Options/concepts generated by these studies are evaluated for feasibility, system impacts, and cost.

FY 1997 (\$ in Thousands):

- (U) \$535 the ICBM Master Plan.
- (U) \$648 Performed technology insertion studies in support of changing ICBM environments.
- (U) \$2,093

(U) _____

- Continue support of Long Range Planning tasks, development of the Systems Options Report, and update of the Logistics Program
- Continue feasibility and life extension studies.
- (U) \$744 Total

FY 1999 (\$ in Thousands):

- (U) \$630 Management Plan and the ICBM Master Plan.
- (U) \$925 Continue to perform technology insertion studies in support of changing ICBM environments.
- (U) \$2,299

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4 - Demonstration and Validation

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0603851F ICBM Dem/Val

PROJECT
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	2,093	2,465	2,345	Continuing
(U) Appropriated Value	2,198	2,465		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-50	-105		
b. SBIR	-55	-57		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-46	
(U) Current Budget Submit/FY 1999 President's Budget	2,093	2,303	2,299	Continuing

(U) Change Summary Explanation:

- Funding: No significant changes.
- Schedule: No significant impact.
- Technical: No significant impact.

(U) C. Other Program Funding Summary (\$ in Thousands): None.

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract Award	X*				X*				X			
(U) Program Reviews		X*	X*		X	X			X	X		
(U) Deliverable Reports				X*				X				X

* Started and/or Completed

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603851F ICBM Dem/Val				PROJECT 4209	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Contractor Engineering Support					1,945	2,158	2,151			
(U) Program Management Support					148	145	148			
(U) Total					2,093	2,303	2,299			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
TRW	SS/CPAF	Oct 95	7,616	7,616	3,823	1,945	1,848	0	0	7,616
TRW (Prime)	C/CPAF	Dec 97	n/a	n/a	0	0	325	2,151	Continuing	Continuing
<u>Support and Management Organizations</u>										
Various	Various	Ongoing	n/a	n/a	1,520	148	130	148	Continuing	Continuing
<u>Test and Evaluation Organizations:</u> None										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603851F ICBM Dem/Val	PROJECT 4209
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Government Furnished Property: None.

	<u>Total</u>	<u>Budget</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to</u>	<u>Total</u>
	<u>Prior to</u>	<u>FY 1997</u>			<u>Complete</u>	<u>Program</u>
	<u>FY 1997</u>					
Subtotal Product Development	3,823	1,945	2,173	2,151	Continuing	Continuing
Subtotal Support and Management	1,520	148	130	148	Continuing	Continuing
Subtotal Test and Evaluation						
Total Project	5,343	2,093	2,303	2,299	Continuing	Continuing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603852F C-130J Dem/Val	PROJECT 4025
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4025 C-130J Dem/Val	0	3,741	0	0	0	0	0	0	8,871
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The C-130J is the next generation C-130. The weapon system incorporates a redesigned 2-crewmember flight station, a modern technology propulsion system, and an integrated digital avionics subsystem. The program modernizes the fleet of Weather Reconnaissance (WC-130) and Special/Psychological (EC-130) aircraft. Additionally, this program continues a theater airlift modernization effort to replace aging C-130E/Hs. USAF has concluded a vulnerability assessment that shows no significant difference in vulnerability between "H" and "J" model aircraft. However, USAF will conduct a vulnerability reduction program to explore the potential to further reduce the chance of wing leading edge and dry bay fires (applicable to the entire C-130 fleet) and to test the new six-bladed composite propeller. This program is in BA4, Demonstration and Validation, because this effort conducts Live Fire Testing (LFT) and the military utility testing of an Air Force unique system.

Acquisition Strategy

USD (A&T) designated the C-130J program a Regulatory Pilot Program, and the USAF is purchasing the C-130J as a commercial item. Consequently, the Service Milestone Decision Authority (MDA) has directed the program use commercial practices and that all contract provisions, review documents, and plans be streamlined to the maximum extent possible. The MDA conducted a Commercial Acquisition Review and Approval prior to contract award in 1996. The Air Force negotiated and awarded a Firm Fixed Price (FFP) type contract with a FY96 base year and FFP options for four additional years. Contract options will provide prices for variable quantities to accommodate program, budget, and appropriation changes. The C-130 Program Office executes acquisition of C-130J and derivative aircraft for the active Air Force, Air National Guard, Air Force Reserve, other military services, other government agencies, and selected Foreign Military Sales. All US Government C-130 aircraft are priced on a standard USAF C-130J configuration. Equipment, components, or services for unique USAF mission requirements, or for other customers, will be negotiated separately.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603852F C-130J Dem/Val	PROJECT 4025																																																							
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <p style="margin-left: 20px;">- (U) \$0 Total</p> <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <p style="margin-left: 20px;">- (U) Live Fire Component Testing (Dry Bay and Propeller)</p> <p style="margin-left: 20px;">- (U) 3,491 Dry Bay Testing</p> <p style="margin-left: 20px;">- (U) 0 Propeller Testing (unfunded)</p> <p style="margin-left: 20px;">- (U) 250 Mission Support</p> <p style="margin-left: 20px;">- (U) \$3,741 Total</p> <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <p style="margin-left: 20px;">- (U) \$0 Total</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total*</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998 PB)</td> <td align="center">0</td> <td align="center">3,968</td> <td align="center">0</td> <td align="center">9,098</td> </tr> <tr> <td>(U) Appropriated Value</td> <td></td> <td align="center">3,968</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="margin-left: 20px;">a. Congressional/ General Reductions</td> <td></td> <td align="center">-134</td> <td></td> <td></td> </tr> <tr> <td style="margin-left: 20px;">b. SBIR</td> <td></td> <td align="center">-93</td> <td></td> <td></td> </tr> <tr> <td style="margin-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="margin-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="margin-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY1998 PB</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/1999 President's Budget</td> <td align="center">0</td> <td align="center">3,741</td> <td align="center">0</td> <td align="center">8,871</td> </tr> </tbody> </table> <p>* Total cost detailed in R-3</p> <p>(U) Change Summary Explanation: Funding: FY98 reflects \$134K in Congressional reductions and \$93K for SBIR. Schedule: N/A Technical: N/A</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total*</u>	(U) Previous President's Budget (FY1998 PB)	0	3,968	0	9,098	(U) Appropriated Value		3,968			(U) Adjustments to Appropriated Value					a. Congressional/ General Reductions		-134			b. SBIR		-93			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY1998 PB					(U) Current Budget Submit/1999 President's Budget	0	3,741	0	8,871
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Project 4025	Page 2 of 5 Pages	Exhibit R-2 (PE 0603852F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603852F C-130J Dem/Val				PROJECT 4025		
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) <u>APAF</u> Budget Activity 02, Other Airlift PE 0401115F (FY97-98 & FY02-03); PE 0401132F (FY98-03) (Aircraft Quantity)		304,209	244,388	125,734	0	0	137,893	142,467	TBD	TBD
		5	3	1	0	0	2	2	TBD	TBD
(U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2
(U) Acquisition Milestones										
(U) H/J Swap Contract (4Q/FY95)										
(U) Follow-on Proposal (2Q/FY96)										
(U) Commercial Acquisition Rev & Approval	*									
(U) Follow-on Contract					X					
(U) First Delivery to USAF						X				
(U) Engineering Milestones										
(U) Rollout - First USAF Aircraft (1Q/FY96)										
(U) First Flight (3Q/FY96)										
(U) Vulnerability Assess. Comp. (4Q/FY96)										
(U) Begin Live Fire Test						X				
(U) Complete Live Fire Test							X			
Project 4025										
Page 3 of 5 Pages										
Exhibit R-2 (PE 0603852F)										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)

DATE **February 1998**

4 - Demonstration and Validation

PE NUMBER AND TITLE
0603852F C-130J Dem/Val

PROJECT
4025

(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Live Fire Component Testing		3,491	
(U) Mission Support		250	
(U) Total	0	3,741	0

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Product Development Organizations: Not applicable

Support and Management Organizations

SPO	PO	Oct 95			250	0	250	0	0	500
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Test and Evaluation Organizations

Air Force Flight Test Center (EAFB)	PO	Oct 95			4,880	0	0	0	0	4,880
TBD (Live Fire Test)					0	0	3,491	0	0	3,491

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603852F C-130J Dem/Val	PROJECT 4025
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: TBD

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				0		0			0
Subtotal Support and Management				250		250			500
Subtotal Test and Evaluation				4,880		3,491			8,371
Total Project				5,130		3,741			8,871

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 4 - Demonstration and Validation			PE NUMBER AND TITLE 0603853F Evolved Expendable Launch Veh (EELV) (Space)					PROJECT 0006			
COST (\$ In Thousands)			FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0006 Evolved Expendable Launch Vehicle			44,263	60,437	0	0	0	0	0	0	173,153
Quantity of RDT&E Articles			0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification:

The Evolved Expendable Launch Vehicle (EELV) program is a space launch system development program. The mission of the EELV program is to partner with industry to develop a national launch capability that satisfies the Government's National Mission Model (NMM) requirements and reduces the cost of space launch by at least 25%. The EELV system includes the launch vehicles, infrastructure, support systems, and interfaces. EELV will provide up to two families of launch vehicles that will launch the Government portion of the NMM currently serviced by Titan II, Delta II, Atlas II, and Titan IV. Evolved from current expendable launch systems or components thereof, EELV will support military, intelligence, and civil mission requirements. This program element is in Budget Activity 4, Demonstration and Validation, because it supports risk reduction, demonstration and validation of technologies, and concept verifications leading to lower cost expendable launch vehicles.

(U) Acquisition Strategy:

The EELV concept of a family of launch vehicles emphasizes commonality of hardware and infrastructure and economies of scale to enhance production, operations, and support efficiencies. Cost improvements will be achieved through commonality; leveraging the commercial market place; reduction of supporting infrastructure (launch pads, manufacturing facilities, workforce); and optimization of production and launch operations, processes, and rates. EELV is an ongoing competitive program that initially used a rolling downselect acquisition strategy. In August 1995 four initial contracts were awarded for the Low Cost Concept Validation (LCCV) phase. In December 1996 the Air Force downselected to two contractors – Lockheed Martin and Boeing (originally McDonnell Douglas) – for the Pre-Engineering and Manufacturing Development (Pre-EMD) phase. In the summer of 1998, contracts will be awarded for the Engineering and Manufacturing Development (EMD) and Initial Launch Services (ILS) phase. The EMD/ILS approach maintains competition throughout the life of the program, leverages the growing commercial launch market, caps the Government's EMD costs, and allows partnership with industry, while still reducing the program's overall cost to launch the NMM by at least 25% over existing systems. The EELV system will launch the government portion of the NMM through 2020.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT		
4 - Demonstration and Validation	0603853F Evolved Expendable Launch Veh (EELV) (Space)	0006		
(U) <u>FY 1997 (\$ in Thousands)</u>				
– (U) EELV Pre-EMD system design.				
\$39,734				
– (U) Systems Engineering.				
\$1,142				
– (U) Program management and other support costs.				
\$3,387				
– (U) Total				
\$44,263				
(U) <u>FY 1998 (\$ in Thousands)</u>				
– (U) Continue EELV Pre-EMD system design and demonstrate readiness to proceed into EMD.				
\$55,900				
– (U) Systems Engineering.				
\$3,714				
– (U) Program management and other support costs.				
\$823				
– (U) EMD funded under PE 0604853F beginning June 98.				
\$0				
– (U) Total				
\$60,437				
(U) <u>FY 1999 (\$ in Thousands)</u>				
– (U) Not Applicable. EELV funded by PE 0604853F.				
\$0				
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>
(U) Previous President's Budget (FY 1998 PB)	42,333	63,260	0	174,033
(U) Appropriated Value	44,457	63,260		
Project 0006	Page 2 of 5 Pages		Exhibit R-2 (PE 0603853F)	

DATE
February 1998

BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603853F Evolved Expendable Launch Veh (EELV) (Space)
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	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>
(U) Adjustments to Appropriated Value				
a. Congressional General Reductions	-1,003	-2,823		
b. Small Business Innovative Research	-1,121			
c. Omnibus or other above threshold reprogramming				
d. Below Threshold Reprogramming	2,000			
e. Rescissions	-70			
(U) Adjustments to Budget Years Since FY98 PB				
(U) Current Budget Submit/FY 1999 President's Budget	44,263	60,437	0	173,153

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998																																																																																																																																																																																																						
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<p>(U) Change Summary Explanation:</p> <ul style="list-style-type: none"> - Funding: The FY98 changes are Congressional reductions of \$2.823M. - Schedule: Not Applicable. - Technical: Not Applicable. <p>(U) C. Other Program Funding Summary (\$ in Thousands)</p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>FY 2000</u></th> <th style="text-align: center;"><u>FY 2001</u></th> <th style="text-align: center;"><u>FY 2002</u></th> <th style="text-align: center;"><u>FY 2003</u></th> <th style="text-align: center;"><u>To Comp</u></th> <th style="text-align: center;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) NRO (Non-AF budget)</td> <td style="text-align: right;">18,600</td> <td style="text-align: right;">4,200</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">0</td> <td style="text-align: right;">95,100*</td> </tr> <tr> <td>(U) Missile Procurement, AF (PE 0305953F) (BA45, P-TBD)</td> <td></td> <td></td> <td></td> <td style="text-align: right;">204,576</td> <td style="text-align: right;">360,818</td> <td style="text-align: right;">359,442</td> <td style="text-align: right;">599,717</td> <td style="text-align: center;">Cont.</td> <td style="text-align: center;">Cont.</td> </tr> <tr> <td>(U) DARPA (Non-AF budget) (PE 0603226E)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: right;">9,845**</td> </tr> <tr> <td colspan="10"><u>Related RDT&E</u></td> </tr> <tr> <td>(U) EELV EMD (PE 0604853F)</td> <td></td> <td style="text-align: right;">26,572</td> <td style="text-align: right;">280,297</td> <td style="text-align: right;">338,319</td> <td style="text-align: right;">305,557</td> <td style="text-align: right;">244,450</td> <td style="text-align: right;">14,822</td> <td></td> <td style="text-align: right;">1,210,017</td> </tr> <tr> <td>(U) EELV Operational System Development (PE 0305953F)</td> <td></td> <td></td> <td style="text-align: right;">3,316</td> <td style="text-align: right;">3,397</td> <td style="text-align: right;">3,477</td> <td style="text-align: right;">2,320</td> <td style="text-align: right;">766</td> <td style="text-align: center;">Cont.</td> <td style="text-align: center;">Cont.</td> </tr> </tbody> </table> <p>* Total includes funding in FY96. ** Total includes funding in FY94.</p> <p>(U) D. Schedule Profile</p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;"></th> <th colspan="3" style="text-align: center;"><u>FY 1997</u></th> <th colspan="3" style="text-align: center;"><u>FY 1998</u></th> <th colspan="3" style="text-align: center;"><u>FY 1999</u></th> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> </tr> </thead> <tbody> <tr> <td colspan="13"><u>LCCV Module</u></td> </tr> <tr> <td>(U) Defense Acquisition Board (DAB) - Milestone I *</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td>(U) Downselect to two contracts *</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td colspan="13"><u>Pre-EMD Module</u></td> </tr> <tr> <td>(U) Pre-EMD contract awards *</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td>(U) Downselect Design Review</td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) EMD DAB - Milestone II</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> </tr> <tr> <td>(U) Development/Initial Launch Services contract awards</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> </tr> </tbody> </table> <p>* Actual Event</p>										<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Comp</u>	<u>Total</u>	(U) NRO (Non-AF budget)	18,600	4,200						0	95,100*	(U) Missile Procurement, AF (PE 0305953F) (BA45, P-TBD)				204,576	360,818	359,442	599,717	Cont.	Cont.	(U) DARPA (Non-AF budget) (PE 0603226E)									9,845**	<u>Related RDT&E</u>										(U) EELV EMD (PE 0604853F)		26,572	280,297	338,319	305,557	244,450	14,822		1,210,017	(U) EELV Operational System Development (PE 0305953F)			3,316	3,397	3,477	2,320	766	Cont.	Cont.		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				1	2	3	4	1	2	3	4	1	2	3	4	<u>LCCV Module</u>													(U) Defense Acquisition Board (DAB) - Milestone I *		X											(U) Downselect to two contracts *		X											<u>Pre-EMD Module</u>													(U) Pre-EMD contract awards *		X											(U) Downselect Design Review					X								(U) EMD DAB - Milestone II										X			(U) Development/Initial Launch Services contract awards										X		
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Comp</u>	<u>Total</u>																																																																																																																																																																																																				
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(U) EELV Operational System Development (PE 0305953F)			3,316	3,397	3,477	2,320	766	Cont.	Cont.																																																																																																																																																																																																				
	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>																																																																																																																																																																																																						
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(U) Downselect Design Review					X																																																																																																																																																																																																								
(U) EMD DAB - Milestone II										X																																																																																																																																																																																																			
(U) Development/Initial Launch Services contract awards										X																																																																																																																																																																																																			
Project 0006			Page 3 of 5 Pages			Exhibit R-2 (PE 0603853F)																																																																																																																																																																																																							

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603853F Evolved Expendable Launch Veh (EELV) (Space)				PROJECT 0006		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Concept Development Contracts				39,734	55,900	0				
(U) Systems Engineering				1,142	3,714	0				
(U) Program management and other support costs				3,387	823	0				
(U) Total				44,263	60,437	0				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)*</u>										
* Information represents only Air Force funds. Does not include DARPA funding of FY94 \$9,845 and NRO funding of: FY96 \$72,300, FY97 \$18,600, FY98 \$4,200.										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Alliant Tech	C/FFP (LCCV)	Aug 95	13,000	13,000	13,000	0	0	0	0	13,000
Boeing	C/FFP (LCCV)	Aug 95	13,000	13,000	13,000	0	0	0	0	13,000
Lockheed Martin	C/FFP (LCCV)	Aug 95	13,000	13,000	13,000	0	0	0	0	13,000
McDonnell Douglas	C/FFP (LCCV)	Aug 95	13,000	13,000	13,000	0	0	0	0	13,000
Lockheed Martin	C/FFP (Pre-EMD)	Dec 96	49,327	49,327	0	19,867	27,950	0	0	47,817
Boeing*	C/FFP (Pre-EMD)	Dec 96	49,327	49,327	0	19,867	27,950	0	0	47,817
* McDonnell Douglas became Boeing via merger in Aug 97.										
<u>Support and Management Organizations</u>										
SPO Mission Spt	Various	Various	N/A	N/A	2,011	1,459	763	0	0	4,233
FFRDC	SS/CPAF	Annual	N/A	N/A	3,554	1,142	3,714	0	0	8,410
Ranges	Various	Various	N/A	N/A	9,014	157	60	0	0	9,231
Other Cntr Spt	Various	Various	N/A	N/A	1,874	1,771	0	0	0	3,645
Project 0006				Page 4 of 5 Pages				Exhibit R-3 (PE 0603853F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603853F Evolved Expendable Launch Veh (EELV) (Space)	PROJECT 0006
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<u>Contractor or</u>	<u>Method/Type or</u>	<u>Obligation</u>	<u>Performing</u>	<u>Office</u>	<u>Total</u>					
<u>Performing</u>	<u>Vehicle</u>	—	<u>EAC</u>	—	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
Not Applicable					0	0	0	0	0	0
Governmentmen										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603854F Global Broadcast Service (GBS) (Space)	PROJECT 2679
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2679 Global Broadcast Service (GBS)	33,094	54,089	70,147	54,315	134,817	258,735	360,507	1,812,347	2,792,051
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: The amounts reflected above include these three efforts:

- GBS Phases 1 & 2	33.1	54.1	70.1	49.3	39.6	29.1	22.2	119.6	431.2
- Wideband Gapfiller MILSATCOM	0.0	0.0	0.0	5.0	95.2	229.6	338.3	292.7	960.9
- Advanced Wideband MILSATCOM (w/ GBS Ph 3)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,400.0	1,400.0

Beginning with the FY00 budget documentation, these three efforts will be reflected as separate projects.

(U) A. Mission Description and Budget Item Justification

Acquire a three-phased Global Broadcast Service (GBS) program which will provide a worldwide, satellite-based, high data rate communications broadcast capability in accordance with the Mission Need Statement approved by the Joint Requirements Oversight Council (JROC) in Aug 95. Acquire a Wideband Gapfiller system, and plan for a subsequent Advanced Wideband system, to host continued GBS, to continue appropriate services now provided by the DSCS system, and to provide a new two-way Ka-band service in accordance with Joint Space Management Board direction based on the Aug 96 MILSATCOM Architecture and recommendations from the Senior Warfighters Forum during the 1997 MILSATCOM Transition analysis. The Air Force was designated executive agent for the GBS Program by USD(A&T) on 27 Mar 96.

GBS will provide efficient high data rate connectivity between many distributed information sources and warfighters who receive the broadcast directly on small, inexpensive user terminals. Broadcast data includes digitized imagery, logistics data, weather data, maps, operational orders (e.g., Air Tasking Order), and video. Phase One was started in 1996 and uses commercial satellite leases to provide a CONUS-based testbed for requirements definition and operational concept refinement. Phase Two will be available for first launch in 1998, and provide a near worldwide GBS capability at military frequencies hosted on the last three UHF Follow-On (UFO) satellites (numbers 8, 9, and 10). Phase Three will provide a global capability at military frequencies hosted on a conceptual Advanced Wideband satellite.

The Gapfiller and Advanced Wideband systems will be procured making maximum use of commercial technology and practices. The 3 Gapfiller satellites will be launched in 2004-5 and will contain GBS Phase 2 equivalent service. The ~5 Advanced Wideband satellites will begin launching ~2008 and host GBS Phase 3.

Funding is in Budget Activity 4, Demonstration and Validation, since it supports Global Broadcast Service technology demonstration and validation.

Note: Funding profile shown does not reflect \$21.3M FY98 RDT&E funds required to align GBS program funding with the Joint Service Cost Position. The Air Force is submitting an Above Threshold Reprogramming (ATR) request to address this funding shortfall and a \$2.1M FY98 O&M shortfall.

DATE
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BUDGET ACTIVITY
4 - Demonstration and Validation

PE NUMBER AND TITLE
0603854F Global Broadcast Service (GBS) (Space)

Acquisition Strategy: Evolutionary acquisition approach making maximum use of commercial acquisition practices and technology. Single integration contractor with total system performance responsibility. (Navy providing space segment for Phase 2 and adapting common receive terminal equipments for shipboard installation.)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603854F Global Broadcast Service (GBS) (Space)	PROJECT 2679
<p>(U) <u>FY 1997 (\$ in Thousands)</u></p> <ul style="list-style-type: none"> - (U)\$ 3,691 Testbed Transponder, Transition and Lease - (U)\$ 1,116 Field Engineering and Demonstration Support - (U)\$ 3,900 UFO GBS Payload - (U)\$ 13,886 System Development and Test - (U)\$ 10,263 Phase 2 Government System Integration - (U)\$ 202 Field Survey and Integration - (U)\$ 36 System Test & Eval Support - (U)\$ 33,094 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U)\$ 3,278 Testbed Transponder, Transition, and Lease - (U)\$ 2,297 Field Engineering and Demonstration Support - (U)\$ 27,704 System Development and Test - (U)\$ 2,000 Initial Communications Connectivity/Interface - (U)\$ 11,908 Phase 2 Government System Integration - (U)\$ 632 Field Survey and Integration - (U)\$ 6,000 Navy Terminals - (U)\$ 199 Joint Spectrum Center - (U)\$ 71 System Test & Eval Support - (U)\$ 54,089 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U)\$ 44,380 System Development and Test - (U)\$ 6,304 Initial Comm Connectivity/Interface, CONUS Transponder Lease - (U)\$ 12,591 Phase 2 Government System Integration - (U)\$ 666 Field Survey and Integration - (U)\$ 6,000 Navy Terminals - (U)\$ 70 Joint Spectrum Center - (U)\$ 136 System Test & Eval Support - (U)\$ 70,147 Total 		
Project 2679	Page 2 of 6 Pages	Exhibit R-2 (PE 0603854F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998																																																							
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603854F Global Broadcast Service (GBS) (Space)			PROJECT 2679																																																							
<p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;"></th> <th style="text-align: right;"><u>FY 1997</u></th> <th style="text-align: right;"><u>FY 1998</u></th> <th style="text-align: right;"><u>FY 1999</u></th> <th style="text-align: right;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998)</td> <td style="text-align: right;">43,565</td> <td style="text-align: right;">56,977</td> <td style="text-align: right;">62,678</td> <td style="text-align: right;">3,141,000</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">45,000</td> <td style="text-align: right;">56,977</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Congressional General Reductions</td> <td style="text-align: right;">-1,024</td> <td style="text-align: right;">-2,888</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-411</td> <td></td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus and Other Above Threshold Reprogram</td> <td style="text-align: right;">-7,300</td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogram</td> <td style="text-align: right;">-3,099</td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td style="text-align: right;">-72</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY98 PB</td> <td></td> <td></td> <td style="text-align: right;">+7,469</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit /FY 1999 President's Budget</td> <td style="text-align: right;">33,094</td> <td style="text-align: right;">54,089</td> <td style="text-align: right;">70,147</td> <td style="text-align: right;">2,792,051</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: FY97 Below Threshold Reprogramming actions (Global Positioning System: -\$1,100; MILSATCOM Terminals: -\$1,999). FY99 increase aligned GBS funding with the Joint Service Cost Position. Air Force GBS Receive Terminals were transferred to PE 33601F, MILSATCOM Terminals, and reclassified to the other procurement appropriation. FY97-FY99 includes GBS Ph 1&2 only. Total cost includes: \$431.2M for GBS Ph 1&2, \$960.9M for Wideband Gapfiller, and \$1,400.0M for Advanced Wideband Schedule: If FY98 funding is not received, Phase 2 IOC will slip from FY99 to FY01. Three Gapfiller Wideband satellites with GBS Phase 2-like capabilities were added and are scheduled for a FY04 first launch. Advanced Wideband satellites, with GBS Phase 3 payload, will begin launching ~2008 vice in 2006. Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> Related RDT&E (U) None Other Appropriations (U) Air Force GBS receive terminals. Included in BPAC 836780, line P-67 -- PE 33601, Milstar Satellite Comm Sys, Other Procurement, AF (U) Navy SATCOM Ship Terminal Programs (U) Army Ground Terminal Programs (U) Navy UFO Program (U) ARPA-DISA Bosnia Operational Communications Augmentation (BOCA) and Joint Broadcast Service (JBS) (U) ARPA Battlefield Awareness and Data Dissemination (BADD) Advanced Concept Technical Demonstration (ACTD) (U) DISA Long Haul Communications</p>		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY 1998)	43,565	56,977	62,678	3,141,000	(U) Appropriated Value	45,000	56,977			(U) Adjustments to Appropriated Value					a. Congressional General Reductions	-1,024	-2,888			b. SBIR	-411				c. Omnibus and Other Above Threshold Reprogram	-7,300				d. Below Threshold Reprogram	-3,099				e. Rescissions	-72				(U) Adjustments to Budget Years Since FY98 PB			+7,469		(U) Current Budget Submit /FY 1999 President's Budget	33,094	54,089	70,147	2,792,051				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>																																																							
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Project 2679	Page 3 of 6 Pages	Exhibit R-2 (PE 0603854F)																																																									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603854F Global Broadcast Service (GBS) (Space)	PROJECT 2679
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Phase I (96-98)												
(U) Joint Warfighter Interoperability Demos (JWID)				x								x
(U) Lease Commercial Transponder		x	x	x	x	x	x	x				
(U) Phase II (98-00+)												
(U) Acquisition Program Reviews - TBD												
(U) Launch UFO #8 (Feb/Mar 98)						x						
(U) Launch UFO #9 (Aug/Oct 98)									x			
(U) Launch UFO #10 (Feb/Mar 99)											x	
(U) Gapfiller Satellites - 3 satellites w/GBS payload (2004/2005)												
(U) GBS Phase 2 Acquisition Milestone Reviews					x							
(U) Initial Wideband Gapfiller Launch (2008)												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY				PE NUMBER AND TITLE				PROJECT		
4 - Demonstration and Validation				0603854F Global Broadcast Service (GBS) (Space)				2679		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Testbed Transponder, Transition, and Lease				3,691	3,278	0			
(U)	Field Engineering and Demonstration Support				1,116	2,297	0			
(U)	UFO GBS Payload				3,900	0	0			
(U)	System Development and Test				13,886	27,704	44,380			
(U)	Communication Connectivity/Interface				0	2,000	6,304			
(U)	Phase 2 Government System Integration				10,263	11,908	12,591			
(U)	Field Survey and Integration				202	632	666			
(U)	Navy Terminals				0	6,000	6,000			
(U)	Joint Spectrum Center				0	199	70			
(U)	System Test & Eval Support				36	71	136			
(U)	Total				33,094	54,089	70,147			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Raytheon Sys Co	CPAF	18 Nov 97				14,524	16,707	42,281	51,656	125,168
Government/TBD					7,975	8,069	24,572	14,403	2,504,030	2,559,049
<u>Support and Management Organizations</u>										
Various					6,025	10,465	12,739	13,327	64,670	107,226
<u>Test and Evaluation Organizations</u>										
Support for Development & Operational Testing					0	36	71	136	365	608

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603854F Global Broadcast Service (GBS) (Space)				PROJECT 2679	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Government Furnished Property:										
<u>Product Development Property</u> - TBD										
<u>Support and Management Property</u> - TBD										
<u>Test and Evaluation Property</u> - TBD										
Subtotal Product Development					7,975	22,593	41,279	56,684	2,555,686	2,684,217
Subtotal Support and Management					6,025	10,465	12,739	13,327	64,670	107,226
Subtotal Test and Evaluation					0	36	71	136	365	608
Total Project					14,000	33,094	54,089	70,147	2,620,721	2,792,051
<p align="center">Program inception (FY96) through FY99 include GBS Ph 1&2 only. Total cost includes: \$431.2M for GBS Ph 1&2, \$960.9M for Wideband Gapfiller, and \$1,400.0M for Advanced Wideband.</p>										

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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603856F Air Force/NRO Partnership (AFNP)	PROJECT 4782
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4782 Air Force/NRO Partnership	0	0	17,645	0	0	0	0	TBD	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The Air Force/NRO Partnership program provides resources to identify areas for integration of Air Force, NRO, and national space efforts. Better partnering between the Air Force and the NRO will help propel Air Force space leadership into the 21st century. Following these investigations, the program resources will be used to conduct joint demonstrations including operations, resources, and space activities, in support of the AF/NRO Integration Planning Group. This PE is in Budget Activity 4 (Demonstration and Validation AKA Program Definition and Risk Reduction) because the nature of the projects will involve testing and demonstrating new cooperative efforts.

The NRO has budgeted an equal amount in FY 1999, reflecting the 50/50 cost sharing ratio established for this program. Both Air Force and NRO will address FY 2000 - 2005 funding to continue this program in their POM - 00 processes.

(U) Acquisition Strategy:

FY 1997 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1999 (\$ in Thousands):

– (U) \$17,645 Conduct joint demonstrations, operations, and space activities in support of the AF/NRO Integration Planning Group.

– (U) \$17,645 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603856F Air Force/NRO Partnership (AFNP)			PROJECT 4782			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>				
		0	0	0		<u>Cost</u>				
(U) Previous President's Budget (FY 1998 PB)		0	0	0		0				
(U) Appropriated Value										
(U) Adjustments to Appropriated Value										
a. Cong Reductions										
b. SBIR										
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming										
(U) Adjustments to Budget Years Since FY 1998 PB				+17,645						
(U) Current Budget Submit FY1999 President's Budget		0	0	17,645		TBD				
(U) Change Summary Explanation:										
Funding: Air Force to begin contributing to AF/NRO Partnership in FY99.										
Schedule: None.										
Technical: None.										
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
Not Applicable										
(U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
		1	2	3	4	1	2	3	4	
(U) AFNP Projects								X		
Project 4782		Page 2 of 4 Pages				Exhibit R-2 (PE 0603856F)				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603856F Air Force/NRO Partnership (AFNP)				PROJECT 4782	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	AF/NRO Partnership				0	0	17,645			
(U)	Total				0	0	17,645			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
TBD										
<u>Support and Management Organizations</u>										
TBD										
<u>Test and Evaluation Organizations</u>										
Not Applicable										
Government Furnished Property:										
None										
Subtotal Product Development										
Subtotal Support and Management										
Subtotal Test and Evaluation										
Project 4782					Page 3 of 4 Pages			Exhibit R-3 (PE 0603856F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE
4 - Demonstration and Validation					0603856F Air Force/NRO Partnership (AFNP)					4782
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Total Project					0	0	0	17,645	TBD	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603860F Joint Precision Approach and Landing Systems - Dem/Val	PROJECT 4652
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4652 Precision Landing Systems	0	0	22,057	16,789	0	0	0	0	38,846
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This effort will modernize the DoD precision landing architecture by replacing aging ship-board and ground precision landing systems (Instrument Landing System (ILS), Precision Approach Radar (PAR), and Instrument Carrier Landing Systems (ICLS)) which are expected to end their useful life by 2005-2010 and address short-term precision landing deficiencies in the near term. The new Joint Precision Approach and Landing System (JPALS) will be rapidly deployable, operate in adverse weather be day-night survivable and maintainable. JPALS will facilitate DoD mission and training needs by enabling US forces to land on any surface worldwide (land and sea) under peacetime and hostile conditions. This effort may result in modification to avionics in over 6,000 Air Force aircraft and may include a ground segment. This program is in budget activity 4 - Demonstration and Validation, Research Category 6.3B because supportability and manufacturing process design considerations must be identified and integrated into the precision landing architecture.

(U) Acquisition Strategy: Demonstration and Validation, multiple contracts, Fixed Price Incentive Fee (FPIF), Firm Fixed Priced contracts (FFP); no Non-Developmental Items (NDI)

(U) FY 1999 (\$ in Thousands):

- (U) \$3,560 Perform Architecture Definitions
- (U) \$4,835 Begin aircraft risk reduction studies and integration analyses
- (U) \$4,965 Begin shipboard risk reduction studies and integration analyses
- (U) \$8,697 Begin development of Local Area Differential Global Positioning System prototypes/risk reduction
- (U) \$22,057 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)						DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603860F Joint Precision Approach and Landing Systems - Dem/Val			PROJECT 4652
(U) B. <u>Program Change Summary (\$ in Thousands)</u>							
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)		0		0		0	0
(U) Appropriated Value		0		0		0	
(U) Adjustments to Appropriated Value							
a. Cong Reductions							
b. SBIR							
c. Omnibus or Other Above Threshold Reprogram							
d. Below Threshold Reprogramming							
(U) Adjustments to Budget Years Since FY 1998 PB					22,057		38,846
(U) Current Budget Submit/FY 1999 President's Budget		0		0	22,057		TBD
 (U) Change Summary Explanation:							
Funding: Increase of \$22,057M in FY99 is to complete Phase 1 activities based upon Milestone 1 direction planned for May 98. (Previous FY97/98 RDT&E funding was located in PE 0305114F.)							
Schedule: N/A							
Technical: N/A							
 (U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> N/A							
 (U) D. <u>Schedule Profile</u>							
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>	
	1	2	3	4	1	2	3
					2	3	4
(U) Acquisition Milestones:							
(U) Milestone I					X		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY					PE NUMBER AND TITLE				PROJECT	
4 - Demonstration and Validation					0603860F Joint Precision Approach and Landing Systems - Dem/Val				4652	
 (U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Prototype Development				0	0	8,697			
(U)	Integration Studies and Analyses				0	0	11,488			
(U)	Systems Engineering/Technical Support				0	0	1,664			
(U)	Program Management Support				0	0	150			
(U)	Travel				0	0	58			
(U)	Total						22,057			
 (U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations:</u>										
TBD	Various	Various	TBD	TBD	0	0	0	15,189	10,073	25,262
<u>Support and Management Organizations</u>										
TBD	Various	Various	TBD	TBD	0	0	0	3,560	3,686	7,246
No contracts more than \$1.0M										
<u>Test and Evaluation Organizations</u>										
TBD			TBD	TBD	0	0	0	3,308	3,030	6,338
Government Furnished Property: N/A										
Project 4652					Page 3 of 4 Pages			Exhibit R-3 (PE 0603860F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0603860F Joint Precision Approach and Landing Systems - Dem/Val				PROJECT 4652		
<u>Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>	
<u>Product Development Property</u>										
N/A										
<u>Support and Management Property</u>										
N/A										
<u>Test and Evaluation Property</u>										
N/A										
Subtotal Product Development							15,189	10,073	25,262	
Subtotal Support and Management							3,560	3,686	7,246	
Subtotal Test and Evaluation							3,308	3,030	6,338	
Total Project							22,057	16,789	38,846	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603876F Space Based Laser (SBL) (Space)	PROJECT 4779
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4779 Space Based Laser	*0	*0	35,000	35,002	34,994	34,980	34,968	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* No FY97 and FY98 Air Force funding, program funded by BMDO (PE0603173C).

(U) A. Mission Description and Budget Item Justification

The Space Based Laser (SBL) program was created to provide the nation with a highly effective, continuous, global boost phase intercept option for both theater and national missile defense. An SBL system could defend against missiles without putting the lives of US military personnel at risk. The long range and speed of light defense allows for boost phase intercept at the earliest possible moment, offering the highest probability that intercepted missile fragments will fall within the attackers territory, rather than defended territory. The SBL system could also provide many ancillary mission capabilities, including air defense, global surveillance, and target detection and designation.

BMDO's directed energy program (PE0603173C, Project 1360) has been addressing several key critical program issues, such as the Alpha laser; optics experiments; laser and optics integration; and acquisition, tracking, pointing, and fire control (ATP/FC) tests. Though the major building blocks have been developed, system integration in a space qualified SBL Readiness Demonstrator (SBLRD) vehicle will provide opportunities for more complete ground and flight testing. The SBLRD is the first step in proving the feasibility and operational contribution of killing ballistic missiles in their boost phase from orbit. The SBLRD could also demonstrate potential contributions to other Air Force missions. This PE is in Budget Activity 4 (Demonstration and Validation) because it is performing Program Definition and Risk Reduction activities in support of SBLRD development.

Acquisition Strategy: The Air Force is the program's executing agent. BMDO and Air Force are jointly funding the SBLRD development activities. SBLRD development contract award planned for 4QFY98.

(U) FY 1997 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

– (U) \$0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998																																																		
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603876F Space Based Laser (SBL) (Space)	PROJECT 4779																																																			
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$15,000 Design, development, and integration of laser payload element - (U) \$15,000 Design, development and integration of optical payload element - (U) \$ 5,000 Design, development and integration of spacecraft element - (U) - (U) - (U) \$35,000 Total <p>* Continue FY98 activities funded by BMDO (PE0603173C).</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> </tr> <tr> <td>(U) Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">35,000</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit (FY 1999 President's Budget)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: right;">35,000</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: Air Force SBLRD development funding starts in FY99.</p> <p style="padding-left: 20px;">Schedule: None.</p> <p style="padding-left: 20px;">Technical: None.</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	0	0	0	0	(U) Appropriated Value					(U) Adjustments to Appropriated Value					a. Cong Reductions					b. SBIR					c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					(U) Adjustments to Budget Years Since FY 1998 PB			35,000		(U) Current Budget Submit (FY 1999 President's Budget)	0	0	35,000	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																	
(U) Previous President's Budget (FY 1998 PB)	0	0	0	0																																																	
(U) Appropriated Value																																																					
(U) Adjustments to Appropriated Value																																																					
a. Cong Reductions																																																					
b. SBIR																																																					
c. Omnibus or Other Above Threshold Reprogram																																																					
d. Below Threshold Reprogramming																																																					
(U) Adjustments to Budget Years Since FY 1998 PB			35,000																																																		
(U) Current Budget Submit (FY 1999 President's Budget)	0	0	35,000	Cont																																																	
Project 4779	<i>Page 2 of 5 Pages</i>		Exhibit R-2 (PE 0603876F)																																																		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603876F Space Based Laser (SBL) (Space)	PROJECT 4779
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(U) **C. Other Program Funding Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> Cont	<u>Total</u> Cont
(U) BMDO, PE0603173C (Project 1360)	93,846	122,010	58,813	58,635	58,367	58,181	57,911		

(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) SBL Readiness Demonstrator Contract Award								X				
(U) Readiness Demonstrator Segments Detailed Definition/Development to prepare for PDR									X			
(U) Component Development/Risk Reduction*									X			
(U) High Altitude Flight Test of ATP Component Technology*											X	

* BMDO (PE0603173C) FY99 schedule profile.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0603876F Space Based Laser (SBL) (Space)			PROJECT 4779		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
Design, development, and integration of laser payload element					0	0	15,000			
Design, development and integration of optical payload element					0	0	15,000			
Design, development and integration of spacecraft element					0	0	5,000			
 (U) Total *					0	0	35,000			
* No FY97 and FY98 Air Force (Program funded by BMDO).										
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
TBD	C/CPAF	4Q98	TBD	TBD	0	0	0	35,000	TBD	TBD
<u>Support and Management Organizations</u>										
Not Applicable.										
<u>Test and Evaluation Organizations</u>										
Not Applicable.										
Project 4779					Page 4 of 5 Pages			Exhibit R-3 (PE 0603876F)		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0603876F Space Based Laser (SBL) (Space)	PROJECT 4779
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property:
None.

Subtotal Product Development	35,000	TBD	TBD
Subtotal Support and Management			
Subtotal Test and Evaluation			
Total Project	0	35,000	TBD

NOTE: No FY97 and FY98 Air Force funding (Program funded by BMDO).

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0604237F Variable Stability In-Flight Simulation Test Aircraft				PROJECT 3308	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3308 Variable Stability In-Flight Simulation Test Aircraft	1,336	5,650	0	0	0	0	0	0	59,508
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** This demonstration and validation program modifies an F-16D to create a versatile high-performance flying simulator to replace the NT-33A aircraft, which retired in May 1997. For the past 39 years, the research and development flight test community extensively employed the variable stability NT-33A for flight evaluation of fielded aircraft upgrades and new aircraft developments. Its success has been directly attributable to its relatively low-cost of operation, rapid response to customer needs, and high degree of credibility in the flight test community. VISTA was developed to replace the NT-33A because the NT-33A's performance was not representative of future aircraft (it was the oldest aircraft in the Air Force still actively flying). VISTA has the capability to simulate a wide range of air vehicles to verify crucial flight control and human factor designs, establish flying qualities specification criteria, and operate as a flying laboratory for flight control and cockpit display research. In addition, the Air Force Test Pilot School has used VISTA, as they have the NT-33A, to safely train test pilots to evaluate aircraft handling quality, avionics, and human factors designs in a realistic high-performance environment. Future costs to operate VISTA will be funded by PE 0603245F, Flight Vehicle Integration, and other users' aircraft development and training programs. There are no plans to request future funding in this PE to continue operating the VISTA aircraft.

(U) **FY 1997 (\$ in Thousands):**

- (U) \$1,336 Upgrade VISTA to permit continued investigation of the flight control laws and performance characteristics of fielded aircraft upgrades, new aircraft developments, and test pilot training.
- (U) Upgraded mechanical and electrical aircraft subsystems, reassembled the aircraft, and checked out modifications to ensure safety of flight on subsequent flight testing and training.
- (U) \$1,336 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
4 - Demonstration and Validation	0604237F Variable Stability In-Flight Simulation Test Aircraft	3308
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$5,650 Continue to upgrade VISTA to permit continued investigation of flight control laws and performance characteristics of fielded aircraft upgrades, new aircraft developments, and test pilot training.- (U) Continue upgrade program to provide electrical and mechanical interfaces for future installation of an F100-PW-299 engine with an existing axisymmetric thrust vectoring nozzle and a programmable display subsystem.- (U) \$5,650 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) 0 Total		
Project 3308	Page 2 of 3 Pages	Exhibit R-2 (PE 0604237F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0604237F Variable Stability In-Flight Simulation Test Aircraft	PROJECT 3308		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	1,338	0	0	0
(U) Appropriated Value	1,400	6,000		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-31	-196		
b. SBIR	-33	-154		
c. Omnibus/Other Above Threshold Reprogrammings				
d. Below Threshold Reprogrammings				
e. Rescissions	-2			
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) Current Budget Submit/FY 1999 President's PB	1,336	5,650	0	59,508
(U) Change Summary Explanation:				
Funding: In FY 1996, the VISTA upgrade program was funded under PE 0603245F, Flight Vehicle Technology Integration, and by other reimbursable customers. In FY 1997 and FY 1998, Congress added funds to PE 0604237F to continue the VISTA upgrade program. VISTA will continue flight testing in FY 1999 and beyond, but will be funded from PE 0603245F and other aircraft test and training programs. There are no plans to request future funding in this PE to continue the VISTA program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u>				
(U) <u>Related Activities:</u>				
- (U) PE 0602201F, Aerospace Flight Dynamics.				
- (U) PE 0603245F, Flight Vehicle Technology Integration.				
- (U) This project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
<div style="display: flex; justify-content: space-between;"> Project 3308 Page 3 of 3 Pages Exhibit R-2 (PE 0604237F) </div>				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0604327F Hardened Target Munitions	PROJECT 4641
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4641 (U) Hard and Deeply Buried Target Defeat System	0	4,981	0	0	0	0	0	0	4,981
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The Hard and Deeply Buried Target Defeat Capability (HDBTDC) program is an effort designed to hold at risk those highest priority assets essential to the enemy's war fighting ability, which are heavily defended and protectively hardened. Hardening techniques include construction of facilities, of which many are deep underground, with multiple layers of reinforced concrete, rock rubble, and/or earth overburden. Other hardened targets include operations within caves, tunnels, and mountains, built using rapidly improving construction equipment, exported by allies and adversaries on a large scale. (Examples include enemy command and control facilities, air defense facilities, facilities for the production, storage, and deployment of weapons including weapons of mass destruction, surface to surface missile launch sites, aircraft storage, artillery sites, etc.) HDBTDC is currently in the Concept Exploration phase, potential solutions include (but are not limited to) Special Forces, conventional short or long range ballistic missiles (land or sea launched), cruise missiles, direct attack munitions, standoff weapons, etc. FY98 funds will complete the Phase 0 Analysis of Alternatives (AOA) study effort, augment ongoing sensitivity and trade studies activity, prepare for System Program Office standup (acquisition support and documentation), and initiate preliminary Phase I Program Definition and Risk Reduction (PDRR) activities. FY 96 and FY 97 Phase 0 (Concept Exploration) Analysis of Alternatives (AOA) expenditures were accomplished in PE 0603311F (Ballistic Missile Technology). This program is in budget activity 4 - Demonstration and Validation, because the prototyping, demonstration, and early operational assessment (risk reduction strategies) associated with technology, manufacturing, and support of several conceptual systems under consideration will occur in FY 98. Formal commencement of Phase I (PDRR) activity will occur early in the first quarter of FY 99.

(U) Acquisition Strategy:

The strategy to accomplish the Phase 0 AOA work was agreed upon by the AOA Study Directors (Headquarters Air Force Space Command and Headquarters Air Combat Command) via the Integrated Product Team (IPT) process. The contract to perform the Phase 0 AOA work is a modification to an existing Systems Engineering and Technical Assistance (SETA) support contract to the Ogden Air Logistics Center (OO-ALC) ICBM System Program Office (SPO) - a Cost Plus Award Fee (CPAF) contract filled by TRW (Colorado Springs). The ICBM SETA support contract is specifically constructed to address space force applications. TRW was instructed (by the IPT) to enlist the unique expertise required for aircraft and cruise missile delivered options, hence subcontracts by TRW to Veda Inc. (Dayton Ohio) and ARA Inc. (Applied Research Associates - Albuquerque NM). The original SETA contract was competed IAW all applicable federal guidelines. Hardened Target Munitions Program is not adequately defined at this time. Preliminary acquisition strategy anticipates a 36 month PDRR.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0604327F Hardened Target Munitions	PROJECT 4641
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(U) FY 1997 (\$ in Thousands):

- (U) \$0
- (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$1,820 Complete Analysis of Alternatives (AOA) study effort.
- (U) \$2,012 Commence System Program Office(s) (SPO) Standup
- (U) \$ 884 Commence Preliminary Program Definition and Risk Reduction (PDRR) Activities (Phase I)
- (U) \$4,716 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$2,012 Continue System Program Office(s) support
- (U) \$2,921 PDRR Activity - Conduct Systems Requirements Reviews (SRR)
- (U) \$4,870 PDRR Activity - Conduct Preliminary Design Reviews (PDR)
- (U) \$9,803 Total

(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	0	0	0	0
(U) Appropriated Value	0	4,981	0	0
(U) Adjustments to Appropriated Value				
a. Cong Reductions		- 163		
b. SBIR		- 102		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	0			
(U) Adjustments to Budget Years Since FY 1998 PB		0	9,803	
(U) Current Budget Submit/FY 1999 President's Budget	0	4,716	9,803	14,519

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 4 - Demonstration and Validation	PE NUMBER AND TITLE 0604327F Hardened Target Munitions	PROJECT 4641
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(U) Change Summary Explanation:

Funding: FY 98 funding is required to complete the Phase 0 Analysis of Alternatives (AOA) and transition the program from Concept Exploration (Phase 0) to Program Definition and Risk Reduction (Phase I), depending on the results of the AOA. FY 99 funds added for program continuation. FY 00 and follow-on funding to be addressed in the FY 00-05 POM process.

Schedule: None

Technical: None

(U) **C. Other Program Funding Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) PE 0603311 Ballistic Missile Technology	\$600	0	0	0	0	0	0	0	3,800*
(U) Total	\$600	0	0	0	0	0	0	0	3,800*

NOTES: * \$3200 in FY96 RDT&E was executed in PE 0603311F (Ballistic Missile Technology) because the AOA was a pre-Milestone I effort.

(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Commence Formal AOA	X*											
(U) Complete AOA									X			
(U) Commence Program Office(s) (SPO) Standup					X							
(U) Milestone I, Commence PDRR									X			
(U) Conduct System Requirements Review (SRR)										X		
(U) Start Preliminary Design										X		
(U) Conduct Preliminary Design Review (PDR)												X

NOTE: * Accomplished (executed) in PE 0603311F (Ballistic Missile Technology)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998				
BUDGET ACTIVITY 4 - Demonstration and Validation				PE NUMBER AND TITLE 0604327F Hardened Target Munitions				PROJECT 4641			
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>											
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>					
(U)	Analysis of Alternatives (AOA)			0	1,820	0					
(U)	SPO(s) Standup and Continued Support			0	2,012	2,012					
(U)	PDRR Activities			0	884	7,791					
(U)	Total			0	4,716	9,803					
* NOTE: FY 96 and FY 97 Phase 0 (Concept Exploration) Analysis of Alternatives (AOA) expenditures were accomplished in PE 0603311F (Ballistic Missile Technology).											
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget FY 2000	Budget to Complete	Total Program
<u>Product Development Organizations</u>											
TRW											
Colorado Spgs	CPAF	Oct 96	5,771*	6,100*	0	0	1,800	0	0	0	1,800
AFMC/OAS											
Kirtland AFB	MIPR	Dec 97	20	20	0	0	20	0	0	0	20
PDRR											
Contractors TBD	CPIF	Sep 98	TBD	TBD	0	0	884	7,791	0	0	8,675
*NOTE: This figure includes FY96/FY97 funds from PE0603311F											
Project 4641				Page 4 of 5 Pages				Exhibit R-3 (PE 0604327F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998	
BUDGET ACTIVITY 4 - Demonstration and Validation					PE NUMBER AND TITLE 0604327F Hardened Target Munitions					PROJECT 4641	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget FY 2000	Budget to Complete	Total Program
<u>Support and Management Organizations</u>											
ASC/YG (Eglin)	CPAF	Oct 97	N/A	N/A	0	0	1,006	1,006	0	0	2,012
SMC/TE (Kirtland)	CPAF	Oct 97	N/A	N/A	0	0	1,006	1,006	0	0	2,012
<u>Test and Evaluation Organizations</u> : None											
Government Furnished Property: None											
(U) Subtotal Product Development					0	0	2,704	7,791	0	0	10,495
(U) Subtotal Support and Management					0	0	2,012	2,012	0	0	4,024
(U) Subtotal Test and Evaluation					0	0	0	0	0	0	0
(U) Total Project					0	0	4,716	9,803	0	0	14,519

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0305176F Combat Survivor Evader Locator (CSEL)	PROJECT 4522
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4522 CSAR EMD	13003	3994	0	0	0	0	0	0	34,496
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Funds for this PE in FY97 and prior were in Budget Activity 3 - Demonstration and Validation.

(U) A. Mission Description and Budget Item Justification

(U) The Combat Survivor/Evader Locator (CSEL) is a joint program, with the Air Force as lead Service, that will provide enhanced Combat Search and Rescue (CSAR) capability by replacing antiquated survivor radios (PRC-90/112) with current and emerging technologies in a new end-to-end system. The CSEL system will be used by all the Services and DoD, and potentially non-DoD government agencies. CSEL system features include a new radio which incorporates two-way, secure over-the-horizon (OTH) messaging, line-of-sight (LOS) voice, near real-time geopositioning, verification of evader identity and condition, low probability of intercept/detection (LPI/LPD), anti-jam, and the potential integration of commercial satellite systems capabilities. This program is in Budget Activity (BA) 5, Engineering and Manufacturing Development (EMD) because it is in engineering and manufacturing development and has not received full-rate production approval.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997

- (U) \$ CSEL Engineering and Manufacturing Development
7,518
- (U) \$ COBRA Base Station Development
2,000
- (U) \$ Other Government Support
3,485
- (U) Total
\$13,003

(U) FY 1998

- (U) \$ CSEL Engineering and Manufacturing Development
2,546

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BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
**0305176F Combat Survivor Evader Locator
(CSEL)**

– (U) \$ Other Government Support
1,448

– (U) \$ Total
3,994

(U) FY 1999

– (U) \$ Not Applicable
0

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0305176F Combat Survivor Evader Locator (CSEL)			PROJECT 4522			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>					
					<u>Cost</u>					
(U) Previous President's Budget (FY1998 PB)		9,218	4,315	0	27,033					
(U) Appropriated Value		9,596								
(U) Adjustments to Appropriated Value										
a. Cong Gen Reductions		-201	-262							
b. SBIR		-177	-59							
c. Omnibus and Other Above Threshold Reprogram		*								
d. Below Threshold Reprogramming		**3,800	***							
e. Rescission		-15								
(U) Adjustments to Budget Years since FY1998 PB										
(U) Current Budget Submit (FY1999 President's Budget)		13,003	3,994	0	34,496					
(U) Change Summary Explanation:										
<p>Funding: * \$4,600 FY97 Omnibus processed, but not yet reflected in funding database. Funding is for UHF/VHF module manufacturing problems and UHF SATCOM Demand Assigned Multiple Access (DAMA)</p> <p>** \$3,800 FY97 BTR to initiate efforts to comply with JCS requirements for DAMA compatibility.</p> <p>*** \$3,999 FY98 BTR processed, but not yet reflected in funding database. Funding is to initiate Defense Information Infrastructure Common Operating Environment (DII COE) development effort for interoperability among Services.</p> <p>Schedule: N/A</p> <p>Technical: N/A</p>										
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U) Other Procurement, Air Force (PE 0305176F)		2,858	5,599	13,757	14,512	14,327	5,866	6,007	Continue	Continue
(BA 63, P-70)										
Project 4522		Page 2 of 4 Pages					Exhibit R-2 (PE 0305176F)			

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0305176F Combat Survivor Evader Locator (CSEL)	PROJECT 4522

(U) RELATED ACTIVITIES: None

(U) **D. Schedule Profile**

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	
(U) Final Design Review	X								
(U) Production Options Proposal				X					
(U) Production Option 1 Award (OPAF)				X					
(U) Government DT/OA					X				
(U) Option 1 (First Unit) Delivery					X				
(U) Production Option 2 Award (OPAF)						X			
(U) Option 2 (First Unit) Delivery							X		
(U) IOT&E Start							X		
(U) Production Option 3 Award (OPAF)								X	
(U) Option 3 Delivery (2nd Qtr FY00)									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0305176F Combat Survivor Evader Locator (CSEL)			PROJECT 4522		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>									
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		
(U) CSEL Engineering and Manufacturing Development					*7,518	**2,546	0		
(U) COBRA Base Station Development					2,000	0	0		
(U) Other Government Support					3,485	1,448	0		
(U) Total					13,003	3,994	0		
* Does not include the FY97 OMNIBUS \$4,600 for CSEL EMD not yet reflected in the funding database									
** Does not include the FY98 BTR \$3,999 for CSEL EMD not yet reflected in the funding database									
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>									
Performing Organizations:									
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Total Program
<u>Product Development Organizations</u>									
Boeing	CPAF	23 Feb 96	49,458	49,458	14,962	9,975	3,864	0	25,026
SMC (COBRA)	Multiple	Multiple	4,000	4,000	2,000	2,000	0	0	4,000
<u>Support and Management Organizations</u>									
Program Support					483	4,991	3,808	0	4,916
<u>Test and Evaluation Organizations</u>									
AFOTEC					54	250	250	0	554
Government Furnished Property: Not Applicable.									
Subtotal Product Development					16,962	11,975	3,864	0	29,026
Subtotal Support and Management					483	4,991	3,808	0	4,916
Subtotal Test and Evaluation					54	250	250	0	554
Total Project					17,499	17,216*	7,922**	0	34,496
* Includes the \$4,600 FY97 OMNIBUS not yet reflected in the funding database.									
** Includes the \$3,999 FY98 BTR not yet reflected in the funding database.									
Project 4522				Page 4 of 4 Pages			Exhibit R-3 (PE 0305176F)		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	14,202	15,406	10,762	3,760	2,081	3,011	3,037	0	81,039
2257 Standard Avionics & JSRC Initiatives	929	1,415	721	736	731	0	0	0	19,896
2258 Standard Inertial Navigation Unit	470	255	0	0	0	0	0	0	3,353
2050 Joint Helmet-Mounted Cueing System (JHMCS)	12,803	13,736	10,041	3,024	1,350	3,011	3,037	0	56,402*
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* Total Air Force Cost

(U) A. Mission Description and Budget Item Justification

This program element explores and develops integrated avionics architectures and components which will reduce acquisition and support costs, increase weapon system performance and availability, and foster weapons system interoperability with standard interfaces. This program element is devoted to the demonstration and Engineering and Manufacturing Development (EMD) of integrated avionics architectures and open systems. The scope is both domestic and international. Reliability and Maintainability (R&M) and deployment footprint play a major role in the identification of specific development efforts within this element. Joint avionics development efforts are pursued through participation in and support of the Joint Service Review Committee (JSRC). Current initiatives include the Embedded Global Positioning System/Inertial Navigation System and the Joint Helmet-Mounted Cueing System. This is budget activity 5 due to the development nature of the effort.

(U) Acquisition Strategy:

Acquisition strategy is incorporated at the project level.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY98 PB)	17,726	16,494	7,884	81,744
(U) Appropriated Value	18,620	16,494		
(U) Adjustments to Appropriated Value				
a. Congressional / General Reductions	-410	-681		
b. SBIR	-484	-407	**	
c. Omnibus or Above Threshold Reprogramming				
d. Below Threshold Reprogramming	-3,495	*		
e. Rescission	-29			
(U) Adjustment to Budget Year since FY98 PB			2,878	
(U) Current Budget Submit/FY 1999 President's Budget	14,202	15,406	10,762	79,543
(U) Change Summary Explanation:				
Funding: FY97: Below Threshold Reprogramming action was to move funds to the F-15 program (PE 0207134F) with equivalent payback in FY99. This was to match work in the out years that was moved because of a 4 month delay in contract initiation.				
FY98: *\$106,000 is pending reprogramming to fund higher priorities; **\$2,000 is pending for an additional SBIR reduction.				
FY99: Increase of \$2,878,000 includes: a \$3,495,000 Zero Baseline Transfer (ZBT) from the F-15 program (PE 0207134F) to BPAC 2050 (reference payback from FY97), decrease of \$217,000 for an economic adjustment, and termination of a subtask (Level of Effort) from BPAC 2257 of \$400,000 for higher AF priorities.				
Schedule: No changes				
Technical: No changes				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> Not Applicable				
(U) D. <u>Schedule Profile</u> See individual projects				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development				PROJECT 2257		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2257 Standard Avionics & JSRC Initiatives	929	1,415	721	736	731	0	0	0	19,896	
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	
<p>(U) A. <u>Mission Description and Budget Item Justification</u> This project identifies, demonstrates and/or develops candidate architecture standards and open system modular components for the Air Force and other services. Maintains/updates the common avionics database as a widely used avionics interoperability/standardization planning tool. Supports international avionics initiatives and standardization activities such as Global Air Traffic Management (GATM) Integrated Product Team. Develops an opportunity matrix for tactical and airlift programs to identify opportunities to leverage investments for aging avionics, parts obsolescence and avionics modernization. Common Avionics Modernization Planning is a Phase 0 (concept exploration) project that explores candidate avionics systems and designs for potential developmental efforts and aircraft interoperability initiatives. The Joint Service Review Committee (JSRC) coordinates avionics standardization projects between the Air Force, Army and Navy. This program is in budget activity 5 because of the development nature of the effort.</p> <p>(U) <u>Acquisition Strategy:</u> These projects are in acquisition Phase 0 (concept exploration) and are accomplished through various prime contractors or Assistance & Advisory Support (A & AS) contracts. They are awarded competitively, and follow the most recent DoD acquisition guidelines using the integrated product development philosophy.</p>										
Project 2257			Page 3 of 19 Pages			Exhibit R-2 (PE 0604201F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604201F Integrated Avionics Planning and Development	2257
(U) <u>FY 1997</u>		
- (U) \$ 180	Continued Tri-Service Standardization / Joint Service Review Committee (JSRC) - Avionics Standardization (AS)	
- (U) \$ 265	Continued Horizontal Avionics Modernization Planning (HAMP)	
- (U) \$ 165	Continued Avionics Planning Baseline	
- (U) \$ 35	Continued Logistics/ Initiative Planning & Support	
- (U) \$ 284	Continued Program Management Support	
- (U) \$ 929	Total	
(U) <u>FY 1998</u>		
- (U) \$ 25	Continue Tri-Service Standardization / Joint Service Review Committee (JSRC) - Avionics Standardization (AS)	
- (U) \$ 265	Continue Horizontal Avionics Modernization Planning (HAMP)	
- (U) \$ 275	Continue Avionics Planning Baseline	
- (U) \$ 600	Complete Logistics/ Initiative Planning & Support	
- (U) \$ 169	Conduct B-52 Steerable Television Evaluation	
- (U) \$ 81	Continue Program Management Support	
- (U) \$ 1,415	Total	
(U) <u>FY 1999</u>		

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BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
0604201F Integrated Avionics Planning and Development

- (U) \$ 25	Continue Tri-Service Standardization / Joint Service Review Committee (JSRC) - Avionics Standardization (AS)
- (U) \$ 265	Continue Horizontal Avionics Modernization Planning (HAMP)
- (U) \$ 175	Continue Avionics Planning Baseline
- (U) \$ 256	Continue Program Management Support
- (U) \$ 721	Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development		PROJECT 2257	
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 98)	964	1,594	1,135	20,563
(U) Appropriated Value	1,013			
(U) Adjustments to Appropriated Value				
a. Congressional / General Reduction	-23	-142		
b. SBIR	-26	-37		
c. Omnibus or Above Threshold Reprogramming				
d. Below Threshold Reprogramming	-35	*		
e. Rescission				
(U) Adjustment to Budget since FY98 PB			-414	
(U) Current Budget Submit/FY 1999 President's Budget	929	1,415	721	19,896
 (U) Change Summary Explanation:				
Funding: FY97: \$35,000 reallocated from BPAC 2257 to BPAC 2258. FY98: *\$10,000 is pending reprogramming to fund higher priorities. FY99: reduction is for higher AF priorities (\$400,000) and an economic adjustment (\$14,000).				
Schedule: No changes				
Technical: No changes				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> Not Applicable				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)										DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development					PROJECT 2257		
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Tri-Service Standardization				*	*				X			
(U) HAMP				*		X			X			
(U) Publish Avionics Planning Baseline				*		X			X			
(U) B-52 Steerable Television Evaluation						X						
X - Planned Effort												
* - Completed Effort												
Project 2257				Page 6 of 19 Pages				Exhibit R-2 (PE 0604201F)				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development			PROJECT 2257		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Tri-Service standardization via JSRC				180	25	25			
(U)	HAMP				265	265	265			
(U)	Avionics Planning Baseline				165	275	175			
(U)	Logistics / Initiative Planning and Support				35	600	0			
(U)	B-52 Steerable Television Evaluation				0	71	0			
(U)	Program Management Support				284	179	256			
(U)	Total				929	1,415	721			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands):</u>										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations:</u> None										
<u>Support and Management Organizations:</u>										
Support Contracts	FFP	Annual 1 Jan	15,423	15,423	12,291	606	1,108	465	953	15,423
Prgm Mgmt Support	Various	Annual 1 Jan	4,473	4,473	3,073	323	307	256	514	4,473
<u>Test and Evaluation Organizations:</u> None										
Government Furnished Property: None										
Project 2257					Page 7 of 19 Pages			Exhibit R-3 (PE 0604201F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development				PROJECT 2257		
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development			0	0	0	0	0	0	0	0
Subtotal Support and Management			19,896	19,896	15,364	929	1,415	721	1,467	19,896
Subtotal Test and Evaluation			0	0	0	0	0	0	0	0
Total Project			19,896	19,896	15,364	929	1,415	721	1,467	19,896

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development				PROJECT 2258		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2258 Standard Inertial Navigation Unit	470	255	0	0	0	0	0	0	3,353	
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	
<p>(U) A. <u>Mission Description and Budget Item Justification</u> Develop DoD standard Embedded Global Positioning System (GPS)/ Inertial Navigation System (INS) (EGI) Precise Positioning System (PPS), (0.8 nm/h free inertial) Navigation System for Army's OH-58 Kiowa Warrior, Army Special Operations Helicopters, Apache AH-64A+ and AH-64 C/D Apache Longbow helicopters, Navy's AH-1W Super Cobra helicopter, F-14, F-18, EA-6B, and S-3 and Air Force A-10, F-15, F-16 and KC-135 aircraft and additional weapon systems as identified. Directly tied to the Congressionally mandated Minimum Avionics Requirement (MAR) capability for DoD aircraft and the Joint Chiefs of Staff (JCS) Radio Navigation Master Plan. Develop enhanced accuracy (0.3 nm/hr) Inertial Navigation Unit (INU) for the F-117A aircraft. Continue development of INU depot Support Equipment (SE) for the Standard Ring Laser Gyro (RLG) program Embedded GPS/INS efforts resulted from a tri-service acquisition plan. Program currently is in phase III (Production). Contracts were awarded on a full and open basis to Honeywell and Litton Industries. This program is in budget activity 5 because of the development nature of the effort.</p> <p>(U) <u>Acquisition Strategy:</u> This program uses two suppliers which compete for future platform missionization and production using a competitive down select process. The two contracts are written with identical terms and conditions to facilitate the downselect process. Contract will be restructured to continue EGI acquisition upgrades from FY 99 through FY 03 to accommodate platforms which are not yet in compliance with the Congressional mandate. The delivery orders are managed in a government-contractor IPT environment with tri-service participation by the Air Force, Navy, and Army.</p>										
Project 2258			Page 9 of 19 Pages			Exhibit R-2 (PE 0604201F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604201F Integrated Avionics Planning and Development	2258
<p>(U) <u>FY 1997 (\$ in Thousands)</u></p> <p>– (U) \$ Continued Engineering Tasks 145</p> <p>– (U) \$ Continued Program Management Support 325</p> <p>– (U) \$ Total 470</p> <p>(U) <u>FY 1998 (\$ in Thousands)</u></p> <p>– (U) \$ Complete Engineering Tasks 99</p> <p>– (U) \$ Complete Program Management Support 156</p> <p>– (U) \$ Total 255</p> <p>(U) <u>FY 1999 (\$ in Thousands)</u></p> <p>– (U) \$ Total 0</p>		
Project 2258	Page 10 of 19 Pages	Exhibit R-2 (PE 0604201F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development	PROJECT 2258																																																				
<p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> Not applicable</p> <p>(U) D. <u>Schedule Profile</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;"></th> <th colspan="4" style="text-align: center;"><u>FY 1997</u></th> <th colspan="4" style="text-align: center;"><u>FY 1998</u></th> <th colspan="4" style="text-align: center;"><u>FY 1999</u></th> </tr> <tr> <th></th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> </tr> </thead> <tbody> <tr> <td>(U) Integrate GPS/INS on Aircraft</td> <td style="text-align: center;">*</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Complete Qualification, Testing, and Evaluation (QT&E)</td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">*</td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>X - Planned Effort * - Completed Effort</p>				<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>					1	2	3	4	1	2	3	4	1	2	3	4	(U) Integrate GPS/INS on Aircraft	*	*	*	*	*	X	X	X					(U) Complete Qualification, Testing, and Evaluation (QT&E)					*	X						
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>																																													
	1	2	3	4	1	2	3	4	1	2	3	4																																										
(U) Integrate GPS/INS on Aircraft	*	*	*	*	*	X	X	X																																														
(U) Complete Qualification, Testing, and Evaluation (QT&E)					*	X																																																
Project 2258	Page 12 of 19 Pages	Exhibit R-2 (PE 0604201F)																																																				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development				PROJECT 2258	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Engineering Tasks					145	99	0			
(U) Program Management Support					325	156	0			
(U) Total					470	255	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Honeywell	FFP/LOE	9/96	110	110	110					110
Litton	FFP/LOE	1/97	10	10	10					10
SA-ALC	MIPR	7/97	50	50	50					50
<u>Support and Management Organizations</u>										
Mission Support	LOE		3,183	3,183	2,458	470	255	0	0	3,183
<u>Test and Evaluation Organizations:</u> None										
Government Furnished Property: None										
Subtotal Product Development			170	170	170	0	0	0	0	170
Subtotal Support and Management			3,183	3,183	2,458	470	255	0	0	3,183
Subtotal Test and Evaluation			0	0	0	0	0	0	0	0
Total Project			3,353	3,353	2,628	470	255	0	0	3,353
Project 2258					Page 13 of 19 Pages			Exhibit R-3 (PE 0604201F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development				PROJECT 2050			
<i>COST (\$ In Thousands)</i>		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2050	Joint Helmet-Mounted Cueing System (JHMCS)	12,803	13,736	10,041	3,024	1,350	3,011	3,037	0	56,402*	
Quantity of RDT&E Articles		0	0	0	0	0	0	0	0	0	
<p>* Total Air Force Cost</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u> This Joint program with the USN will develop a helmet display system, capable of depicting aircraft heading data, pilot's viewing perspective, target indication graphics and digital information. Consolidating this information on the pilot's visor allows the pilot to quickly align sensors and weapons on targets and engage threats using high off-boresight angle weapons such as the AIM-9X. The JHMCS includes a helmet with a mounted visor display capability, a helmet-vehicle interface cable, and several other components. JHMCS is currently in Phase II, Engineering & Manufacturing Development (EMD). This program is in budget activity 5 because of the development nature of the effort.</p> <p>(U) <u>Acquisition Strategy:</u> The Joint Helmet Mounted Cueing System (JHMCS) is an ACAT III joint USAF/USN program (USAF - executive service) currently in EMD. The contract structure is a Cost Plus Award Fee (CPAF) contract awarded in a competitive source selection environment. Our CPAF contract is through Boeing - St. Louis for integration into the F-15 and F/A-18. Lockheed Martin will be responsible for platform integration into the F-16 and F-22. Boeing has subcontracted to Vision Systems International (VSI) to provide JHMCS subsystems hardware/software. VSI is a company which is a partnership between Elbit (an Israeli company based in Ft Worth, TX) and Kaiser Electronics. The Joint Program Office is using a unique approach of developing common hardware as Contractor Furnished Equipment (CFE) to minimize platform integration risk. The next major program milestone is first flight in Oct 98.</p>											
Project 2050		<i>Page 14 of 19 Pages</i>				Exhibit R-2 (PE 0604201F)					

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development	PROJECT 2050
(U) <u>FY 1997</u>		
– (U) \$ 11,216	Continued Joint Helmet Mounted Cueing System (JHMCS) EMD contract.	
– (U) \$ 761	Conducted Risk Reduction (MDA, LMTAS, & Lab Technology)	
– (U) \$ 397	Continued Test Support (AFFTC)	
– (U) \$ 429	Continued Program Management Support	
– (U) \$ 12,803	Total	
(U) <u>FY 1998</u>		
– (U) \$ 10,786	Continue Joint Helmet Mounted Cueing System (JHMCS) EMD contract.	
– (U) \$ 600	Continue Risk Reduction (LMTAS)	
– (U) \$ 1,666	Continue Test Support (AFFTC)	
– (U) \$ 684	Continue Program Management Support	
– (U) \$ 13,736	Total	
(U) <u>FY 1999</u>		
– (U) \$ 7,186	Continue Joint Helmet Mounted Cueing System (JHMCS) EMD contract.	
– (U) \$ 2,255	Continue Test Support (AFFTC)	
– (U) \$ 600	Continue Program Management Support	
Project 2050	Page 15 of 19 Pages	Exhibit R-2 (PE 0604201F)

DATE
February 1998

BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
**0604201F Integrated Avionics Planning and
Development**

– (U) \$ Total
10,041

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development						PROJECT 2050	
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Milestone II (EMD Contract Award)		*										
(U) Critical Design Review				*								
(U) System Integration Testing						X						
(U) Flight Test									X			
(U) Functional Configuration Audit											X	
X - Planned Effort												
* - Completed Effort												
Project 2050			Page 17 of 19 Pages						Exhibit R-2 (PE 0604201F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998	
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT	
5 - Engineering and Manufacturing Development	0604201F Integrated Avionics Planning and Development	2050	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) EMD Effort	11,216	10,786	7,186
(U) Risk Reduction Tasks	761	600	0
(U) Test Support (AFFTC)	397	1,666	2,255
(U) Program Management Support	429	684	600
(U) Total	12,803	13,736	10,041
Project 2050			
Page 18 of 19 Pages			
Exhibit R-3 (PE 0604201F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604201F Integrated Avionics Planning and Development				PROJECT 2050	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands):</u>										
Performing Organizations:										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Product Development Organizations</u>										
MDA/LMTAS	CPAF	2/97	43,856	43,856	6,863	11,216	10,786	7,186	7,805	43,856
<u>Support and Management Organizations</u>										
Various	Various	2/97	8,132	8,132	2,521	1,210	1,284	600	2,517	8,132
<u>Test and Evaluation Organizations:</u>										
Various	Various	2/97	4,414	4,414	16	377	1,666	2,255	100	4,414
Government Furnished Property: None										
Subtotal Product Development			43,856	43,856	6,863	11,216	10,786	7,186	7,805	43,856
Subtotal Support and Management			8,132	8,132	2,521	1,210	1,284	600	2,517	8,132
Subtotal Test and Evaluation			4,414	4,414	16	377	1,666	2,255	100	4,414
Total Project			56,402	56,402	9,400	12,803	13,736	10,041	10,422	56,402
Project 2050					Page 19 of 19 Pages			Exhibit R-3 (PE 0604201F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604218F Engine Model Derivative Program (EMDP)				PROJECT 2634				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2634 Engine Model Derivative Program (EMDP)				1,474	701	0	0	0	0	0	0	10,584
Quantity of RDT&E Articles				0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

EMDP is an engineering development level of effort program that provides the latest engine technology advances to current weapon systems and provides a framework for engine development for future systems. EMDP contributes to system life extension, reduced life cycle cost, and enhanced performance. Enhanced performance is required to counter increases in system weight and increased threat capability. EMDP demonstrates derivative engine concepts incorporating advanced technology and components from government and contractor funded programs. EMDP demonstrates advances in performance, durability, operability, supportability, reliability, maintainability, and unique capabilities, such as thrust reversing and vectoring nozzles. These demonstrations are in prototype derivatives of existing engines prior to engineering and manufacturing development (EMD). Early demonstration of improved engine characteristics significantly reduces risk and shortens engine development and qualification, allowing quick, cost-effective response to weapon system needs. EMDP also evaluates candidate engines (commercial or military) to provide competitive engine opportunities. EMDP ensures the Air Force has propulsion alternatives to meet near- and far-term needs. EMDP plans for and sustains the engineering development necessary to provide increased performance, reduced life cycle cost and system life extension for air breathing engines for current and future systems. This program is in budget activity 5 - Engineering and Manufacturing Development because it applies advanced technology to existing engines to demonstrate possible performance improvements.

(U) Acquisition Strategy:

Contracts within this Program Element are awarded sole source to engine manufacturers. EMDP tasks are generally assigned to original engine manufacturers. Tasks are assigned based on available funding and prioritization of candidate tasks.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 100 Accomplished AGM-130 Flight Demonstration. This effort supported the gas turbine engine replacement for the weapon's current solid rocket motor. The gas turbine engine will extend the range of the AGM-130 beyond its present capability, and allow launch beyond the range of selected surface-to-air threats.
- (U) \$ 220 Continuation of T-38 Roadmapping study. Supports Air Education and Training Command (AETC) and T-38 System Program Director (SPD) request to provide and evaluate propulsion options for the T-38 aircraft fleet.
- (U) \$ 104 A-10 Roadmapping study. This effort supported an Air Combat Command (ACC) and SPD request to provide and evaluate propulsion options for the A-10 aircraft. Addressed deficiencies in Mission Area Plans. Could help reduce life cycle costs of the A-10 aircraft.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604218F Engine Model Derivative Program (EMDP)	2634
<ul style="list-style-type: none"> - (U) \$ 130 Studies for Global Hawk Unmanned Aerial Vehicle (UAV) and other gas turbine and hypersonic rocket systems. - (U) \$ 800 TF33 re-engining study for the B-52, KC-135, E-3A, AWACS, and JSTARS. - (U) \$ 120 Mission Support/Travel - (U) \$ 1,474 Total (U) <u>FY 1998 (\$ in Thousands):</u> <ul style="list-style-type: none"> - (U) \$ 310 B-1 roadmap study. Assist the B-1 System Program Director, the Propulsion Product Group Manager and ACC in developing a long term propulsion plan of enhancements, modifications and upgrades to meet unique B-1 requirements. - (U) \$ 110 Completion of the TF33 re-engining study for the B-52, KC-135, E-3A, AWACS, and JSTARS. - (U) \$ 44 Hypersonic Rocket Study and Small Gas Turbine Engine Study. - (U) \$ 120 Update F-15/F-16 Engine Roadmap for ACC. - (U) \$ 117 Mission Support/Travel - (U) \$ 701 Total (U) <u>FY 1999 (\$ in Thousands):</u> <ul style="list-style-type: none"> - (U) \$ 0 Funding deleted beginning FY99 		
Project 2634	Page 2 of 7 Pages	Exhibit R-2 (PE 0604218F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604218F Engine Model Derivative Program (EMDP)			PROJECT 2634
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget FY1998 PB	675	741	767	Continuing
(U) Appropriated Value	705	741		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-15	-24		
b. SBIR	-15	-16		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	800			
e. Rescissions	-1			
(U) Adjustments to Budget Years Since FY 1998 PB			-767	
(U) Current Budget Submit/FY1999 President's Budget	1,474	701	0	10,584
 (U) Change Summary Explanation:				
Funding: Reductions occurred to meet higher priority Air Force needs. Reprogramming of \$800K in FY97 was for a SAF/AQ directed evaluation of the re-engining of TF33 engine powered aircraft.				
Schedule: N/A				
Technical: Level of effort for planned studies was reduced in scope in FY97 and FY98.				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
The following PEs do work that is technically related to EMDP, but there are no programmatic dependencies:				
(U) - PE # 0603202F, Aircraft Propulsion Subsystem Integration, provides fan and low pressure turbine technology.				
(U) - PE # 0603216F, Advanced Turbine Engine Gas Generator, provides compressor, combustor, and high pressure turbine technology.				
(U) - PE # 0602203F, Aerospace Propulsion, provides additional component and engine test data.				
(U) - PE # 0207268F, Aircraft Engine Component Improvement Program, complements EMDP by addressing engine safety problems, service-revealed deficiencies, and improved reliability, but not improved performance.				
(U) - The Air Force and Navy have a broad memorandum of understanding for joint cooperative propulsion programs in areas of common interest.				
(U) - There is no unnecessary duplication of effort within the Air Force or the Department of Defense.				
 Project 2634 Page 3 of 7 Pages Exhibit R-2 (PE 0604218F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604218F Engine Model Derivative Program (EMDP)						PROJECT 2634			
(U) D. <u>Schedule Profile:</u> (Task Driven)														
		<u>FY 1997</u>					<u>FY 1998</u>					<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4		
(U) Start TF33 Re-engining Evaluation			*											
(U) Finish AGM Flight Demo					*									
(U) Finish T-38 Roadmap					*									
(U) Finish A-10 Roadmap						*								
(U) Finish Global Hawk Evaluation					*									
(U) Start B-1 Roadmap					*									
(U) Finish TF33 Re-engining Evaluation								X						
(U) Start Hypersonic Rocket Evaluation								X						
(U) Start F-15/F-16 Roadmap								X						
(U) Finish Hypersonic Rocket Evaluation									X					
(U) Finish B-1 Roadmap									X					
(U) Finish F-15/F-16 Roadmap										X				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		February 1998	
PE NUMBER AND TITLE 0604218F Engine Model Derivative Program (EMDP)		PROJECT 2634	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
	<u>FY97</u>	<u>FY98</u>	<u>FY99</u>
AGM Flight Demonstration	100	0	0
T-38 Roadmap	220	0	0
A-10 Roadmap	104	0	0
Global Hawk Evaluation	130	0	0
TF33 Re-engining Evaluation	800	110	0
B-1 Roadmap	0	310	0
Hypersonic Rocket Evaluation	0	44	0
F-15/F-16 Roadmap Update	0	120	0
Mission Support	120	117	0
PE TOTAL	1,474	701	0
Project 2634			
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Exhibit R-3 (PE 0604218F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604218F Engine Model Derivative Program (EMDP)			PROJECT 2634		
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
P & W	FFP/CPFF	Mar 96	\$1,457	\$1,457	\$ 1,379	\$ 0	\$ 78	\$ 0	\$ 0	\$1,457
GE	FFP/CPFF	Mar 96	\$2,767	\$2,767	\$ 1,203	\$ 1,124	\$ 440	\$ 0	\$ 0	\$2,767
Williams Int'l	FFP/CPFF	Mar 96	\$ 480	\$ 480	\$ 336	\$ 100	\$ 44	\$ 0	\$ 0	\$ 480
Allison	FFP/CPFF	Mar 96	\$1,695	\$1,695	\$ 1,578	\$ 95	\$ 22	\$ 0	\$ 0	\$1,695
Teledyne CAE	FFP/CPFF	Mar 96	\$2,918	\$2,918	\$ 2,883	\$ 35	\$ 0	\$ 0	\$ 0	\$2,918
Allied Signal	FFP/CPFF	Mar 96	\$ 186	\$ 186	\$ 186	\$ 0	\$ 0	\$ 0	\$ 0	\$ 186
Sundstrand	CPFF	Mar 96	\$ 1	\$ 1	\$ 1	\$ 0	\$ 0	\$ 0	\$ 0	\$ 1
Microturbo	CPFF	Mar 96	\$ 1	\$ 1	\$ 1	\$ 0	\$ 0	\$ 0	\$ 0	\$ 1
Rolls Royce	CPFF	Mar 96	\$ 1	\$ 1	\$ 1	\$ 0	\$ 0	\$ 0	\$ 0	\$ 1
Total			\$9,506	\$9,506	\$ 7,568	\$1,354	\$ 584	\$ 0	\$ 0	\$9,506
<u>Support and Management Organizations</u>										
In-House Support			\$1,038	\$1,038	\$ 841	\$ 120	\$ 117	\$ 0	\$ 0	\$1,078
<u>Test and Evaluation Organizations</u>										
Not Applicable.										
Government Furnished Property: None										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE					PROJECT
5 - Engineering and Manufacturing Development	0604218F Engine Model Derivative Program (EMDP)					2634
	Total					
	Prior to	Budget	Budget	Budget	Budget to	Total
	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
Subtotal Product Development	\$ 7,568	\$ 1,354	\$ 584	\$ 0	\$ 0	\$ 9,506
Subtotal Support and Management	\$ 841	\$ 120	\$ 117	\$ 0	\$ 0	\$ 1,078
Subtotal Test and Evaluation	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
Total Project	\$ 8,409	\$ 1,474	\$ 701	\$ 0	\$ 0	\$ 10,584

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604222F Nuclear Weapons Support
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	6,124	4,456	4,977	5,391	5,605	6,803	7,065	Continuing	Continuing
4236 Engineering Analysis	2,158	676	692	876	850	1,797	1,796	Continuing	Continuing
5708 Nuclear Weapons Support	3,966	3,780	4,285	4,515	4,755	5,006	5,269	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Provides funds for maintaining core USAF nuclear weapon system expertise. Includes in-house technical capabilities, contractual efforts, supplies and equipment, travel and salaries of the USAF Nuclear Weapons Center of Excellence’s civilian and military nuclear weapon and counterproliferation specialists at Kirtland Air Force Base. Provides technical guidance for continued and improved weapons capability, interoperability, safety, surety, security, development, stockpile management and retirement and counterproliferation assessments. Customers are: DoD (Air Force, Navy, Nuclear CINCs, Joint Staff, OSD and Defense Special Weapons Agency [DSWA]), DOE and NATO. Supports US Strategic Command and Air Combat Command Required Operational Capability 16-71 (Peacekeeper), 12-76 (Air Launched Cruise Missile), 6-76 (B61 Strategic Bomb), 6-69 (B83 Modern Strategic Bomb), and SAC System Operational Requirements Document 13-82-III (Advanced Cruise Missile). Air Force representative for development and implementation of the Joint DoD-DOE Surety Plan, DOE Stockpile Stewardship Plan, DoD/DOE Long Range Planning Assessment and the DoD/DOE Annual Certification. These plans document nuclear weapon issues which benefit from the application of risk assessment, data collection, model development and effectiveness analysis. Counterproliferation efforts include identifying, evaluating and assessing current and projected counterproliferation systems operating in joint environments. This work is tied to the DOE nuclear weapons development process independent of the DoD acquisition system. Weapons are always undergoing some form of RDT&E to continually assure safety, reliability and operational readiness as the DoD restructures the nation’s nuclear stockpile. Therefore, USAF platforms require continuing engineering development and analysis to ensure compatibility and safety of nuclear systems. Funding this element is essential to maintaining current safety and reliability levels in the US nuclear stockpile as well as assessing current and future USAF counterproliferation needs. The USAF Nuclear Weapons Center of Excellence is responsible for all USAF nuclear weapons program management, development, systems engineering, nuclear surety engineering, engineering analyses and weapons support procedure changes. These efforts place this project in RDT&E research category/budget activity 5, Engineering and Manufacturing Development.

(U) Acquisition Strategy: See individual project R-2s for details.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604222F Nuclear Weapons Support					
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget FY 1998 PB	5,655	4,782	5,005	Cont					
(U) Appropriated Value	5,788	4,782							
(U) Adjustments to Appropriated Value									
a. Congressional/General Reductions	-133	-228							
b. SBIR		-98							
c. Omnibus or Other Above Threshold Reprogram									
d. Below Threshold Reprogramming (BTR)	478								
e. Rescissions	-9								
(U) Adjustments to Budget Years Since FY98 PB			-28						
(U) Current Budget Submit/FY 1999 President's Budget	6,124	4,456	4,977	Cont					
(U) Change Summary Explanation:									
Funding: Increase in FY97 due to additional efforts in Agent Defeat Weapon (ADW) Analysis of Alternatives Study. Reduction in FY 99 is civilian pay repricing and non-pay inflation changes.									
Schedule: N/A									
Technical: N/A									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
(U) Not Applicable								Compl	Cost
<u>Related RDT&E:</u>									
(U) PE0603851F, ICBM Modernization Dem/Val.									
(U) PE0604851F, ICBM Modernization EMD									
(U) PE0101122F, Air Launched Cruise Missile									
(U) PE0101120F, Advanced Cruise Missile									
(U) PE0101113F, B-52 Squadrons.									
(U) PE0101126F, B-1B Squadrons									
(U) PE0604240F, B-2 Advance Technology Bomber									
(U) PE0101127F, B-2 Squadrons.									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604222F Nuclear Weapons Support					
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To Compl	Total Cost
(U) PE0207130F/0207134F, F-15 A-D Squadrons, F-15E Squadrons. (U) PE0207590F SEEK EAGLE.									
(U) D. <u>Schedule Profile</u>									
Technical Capabilities Maintained For:		<u>FY 1997</u> ²		<u>FY 1998</u> ²		<u>FY 1999</u> ²			
Active Stockpile Weapons	1	2 3	4	1	2 3	4	1	2 3	4
(U) - W80 (ALCM, ACM, TLAM)									
(U) - B61-7, 11, B83 (Strategic Bombs)									
(U) - B61-3, 4, 10 (Tactical Bombs)									
(U) - W62,W78, W87 (Minuteman III & Peacekeeper)									
Weapons only in Inactive Stockpile (In Storage)									
(U) - W84 (GLCM)									
Weapons in Retirement¹									
(U) - W69 (SRAM A)									
(U) - W56 (Minuteman II)									
(U) - B53 Strategic Bomb									
<i>Note1: Weapons remain in USAF custody pending DOE scheduling for shipment and dismantlement.</i>									
<i>Note2: Stockpile Data, i.e., IOC, retirement dates, etc. are classified</i>									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604222F Nuclear Weapons Support				PROJECT 4236				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4236	Engineering Analysis			2,158	676	692	876	850	1,797	1,796	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification</u> Funds the engineering analysis performed on contract for all USAF nuclear weapon systems. Contractors provide technical expertise unavailable through organic resources in critical areas of nuclear weapons safety and security, nuclear operations and counterproliferation.</p> <p>(U) <u>Acquisition Strategy:</u> Multiple small, firm fixed price contracts for contractors and MIPRs to government labs for technical analyses and technical support in safety, operations and counterproliferation assessments.</p> <p>(U) <u>FY 1997 (\$ in Thousands)</u></p> <ul style="list-style-type: none"> - (U) \$329 Nuclear Aircraft System Support. Revised and verified nuclear weapons loading, delivery, warhead mate and demate technical orders; provided support on the nuclear hardness database; provided Aircraft Monitor and Control (AMAC) software analysis and technical expertise for continued nuclear weapons integration on US and non-US aircraft systems. Developed WE1841 Test Set software and procedures for surveillance testing of the B-52H and the PA-200. - (U) \$1,119 Nuclear Weapons Program Support. Provided technical expertise to support development programs including the B61-11 modification, W87 life extension program, W62 life extension study, W78 life extension study, B83 spin rocket motor development plans, installation plans for B83-1/ALT 752 (new radar/height of burst), joint AF/DOE test planning, and W84 dormant storage plans; fielded and updated nuclear weapon military characteristics and/or stockpile-to-target sequences for six weapons systems; documented and supported weapon program actions, agreements, and program status including over 35 Project Officer Group reports, Annual Certification Reports; and B53 retirement plans; updated inactive stockpile plans for all systems; closed out B61-0,2,5 retirements; updated W56 dismantlement/aeroshell reuse plans, and documented W80 hedge and yield analysis studies. - (U) \$710 Counterproliferation Assessments. Provided technical support for the Agent Defeat Weapon (ADW) Assessment of Alternatives (AoA) Study (DoD Phase 0); developed empirical models of chemical and biological agent lethality from various concept mechanisms; estimated analytical uncertainty the Empirical Lethality Models (ELM); evaluated weapon effectiveness of conventional baseline systems against defined target set; assessed possible concept countermeasures, battle-damage-assessment (BDA), target characterization, and operational planning. - (U) \$2,158 Total 												
Project 4236				Page 4 of 15 Pages				Exhibit R-2 (PE 0604222F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE PROJECT	
5 - Engineering and Manufacturing Development	0604222F Nuclear Weapons Support 4236	
(U) <u>FY 1998 (\$ in Thousands)</u>		
- (U) \$190	Nuclear Aircraft System Support. Revise and verify nuclear weapons loading, delivery, warhead mate and demate technical orders; support the US Strategic Command's nuclear safe escape effort; provide support on the nuclear hardness database; perform aircraft software analysis; develop WE1841 Test Set software and procedures for surveillance testing of the B-2A; and provide technical expertise for continued nuclear weapons integration on US and non-US aircraft systems.	
- (U) \$280	Nuclear Weapons Program Support. Provide technical expertise to support development, fielding and updates of nuclear weapon military characteristics/stockpile-to-target sequence documents; document and support all weapon safety analyses, program actions, agreements, and program status; conduct special studies on stockpile related matters, provide technical support on inactive stockpile issues, use control, long term storage, life extension and dismantlement issues to weapon Lead Project Officers and Headquarters, USAF.	
- (U) \$100	Nuclear Weapons/System Assessments. Provide technical assessments and support on nuclear safety analyses and limited special studies.	
- (U) \$106	Counterproliferation Assessments. Provide technical support for the ADW AoA Study (DoD Phase 0) including continued development of the chemical/biological ELM, assessment of countermeasures, BDA, target characterization, and operational planning; initiate experimental efforts to enhance the development of the ELM; begin efforts for Validation, Verification and Accreditation of ADW codes and models for incorporation in USAF target planning tools; continue weapon effectiveness assessment of ADW concepts against the ADW target set; and provide other service expertise in the definition and development of issues related to ADW and counterproliferation.	
- (U) \$676	Total	
(U) <u>FY 1999 (\$ in Thousands)</u>		
- (U) \$192	Nuclear Aircraft System Support. Revise and verify nuclear weapons loading, delivery, warhead mate and demate technical orders; provide support on the nuclear hardness database, perform aircraft software analysis; and provide technical expertise for continued nuclear weapons integration on US and non-US aircraft systems.	
- (U) \$300	Nuclear Weapons Program Support. Provide technical expertise to support development, fielding and updates of nuclear weapon military characteristics/stockpile-to-target sequence documents; document and support all weapons safety analyses, program actions, agreements, and program status; conduct special studies on stockpile related matters, provide technical support on inactive stockpile issues, use control, long term storage, life extension and dismantlement issues to weapon Lead Project Officers and Headquarters, USAF.	
- (U) \$100	Nuclear Weapons/System Assessments. Provide technical assessments and support on nuclear safety analyses and limited special studies.	
- (U) \$100	Counterproliferation Assessments. Provide technical support for the ADW AoA Study (DoD Phase 0) including technical expertise in the evaluation of nuclear, thermal, chemical, emitter and conventional systems identified as possible Agent Defeat concepts; enhance the ELM; complete Validation, Verification and Accreditation of ADW codes and models for incorporation in USAF target planning tools; and support final Intelligence Support Plan (ISP) requirements of ADW alternatives.	
- (U) \$692	Total	
Project 4236	Page 5 of 15 Pages	Exhibit R-2 (PE 0604222F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		PE NUMBER AND TITLE 0604222F Nuclear Weapons Support		PROJECT 4236
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget FY 1998 PB	1,689	715	706	Cont
(U) Appropriated Value	1,726	715		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-46	-24		
b. SBIR		-15		
c. Omnibus or Other Above Threshold				
Reprogramming				
d. Below Threshold Reprogramming	478			
e. Rescissions				
(U) Adjustments to Budget Years Since FY98 PB			-14	
(U) Current Budget Submit/FY 1999 President's Budget	2,158	676	692	Cont
(U) Change Summary Explanation:				
Funding: Increase in FY97 due to additional efforts in Agent Defeat Warhead (ADW) Analysis of Alternatives Study. Changes in FY 99 due to non-pay inflation changes.				
Schedule: N/A				
Technical: N/A				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) Not Applicable				
(U) D. <u>Schedule Profile</u>				
(U) Not Applicable				
Project 4236		Page 6 of 15 Pages		Exhibit R-2 (PE 0604222F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604222F Nuclear Weapons Support				PROJECT 4236	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Contractor Engineering Support					2,158	676	692			
(U) Total					2,158	676	692			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Miscellaneous	MIPR/FFP	1Q FY98	NA	NA	Cont	2,158	676	692	Cont	Cont
DOE/Albuquerque Ops, Albuquerque, NM										
TECH REPS, Inc., Albuquerque, NM										
Orion International, Albuquerque, NM										
Naval Air Warfare Center, Indianapolis, IN										
Silicon Graphics, Albuquerque, NM										
Kaman Sciences Corp, Boston MA										
Albuquerque Logistics, Albuquerque, NM										
<u>Support and Management Organizations</u>										
None										
<u>Test and Evaluation Organizations</u>										
None										
Project 4236					Page 7 of 15 Pages			Exhibit R-3 (PE 0604222F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604222F Nuclear Weapons Support	PROJECT 4236
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property:

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u> None									
<u>Support and Management Property</u> None									
<u>Test and Evaluation Property</u> None									
Subtotal Product Development					2,158	676	692	Cont	Cont
Subtotal Support and Management					0	0	0	0	0
Subtotal Test and Evaluation					0	0	0	0	0
Total Project					2,158	676	692	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604222F Nuclear Weapons Support				PROJECT 5708	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
5708 Nuclear Weapons Support	3,966	3,780	4,285	4,515	4,755	5,006	5,269	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification</u> Funds Air Force Nuclear Center of Excellence civilians at Kirtland AFB, New Mexico providing technical and engineering support for all USAF nuclear weapon systems and counterproliferation technical efforts.</p> <p>(U) <u>Acquisition Strategy:</u> RDT&E funds primarily provide for Air Force technical civilian personnel providing nuclear weapons management and development. These scientists and engineers interface with Air Force nuclear weapon System Program Offices, operational commands and the Department of Energy, performing engineering development and analysis to ensure continued and improved weapons safety, security, reliability and compatibility.</p> <p>(U) <u>FY 1997 (\$ in Thousands)</u></p> <p>– (U) \$1,050 Nuclear Aircraft System Support. Updated all fighter aircraft safe escape information and generated initial B-2A safe escape data for inclusion into the aircrew delivery manuals; supported the US Strike Aircraft Operational Safety Review and C-17A Special Safety Study; continued management of the F-15E, B-52H and B-2A Project Officers Groups (POGs) and the Nuclear Air Logistics POG; provided support for the B-2A Nuclear Certification Working Group and the F-16 and B-1B Project Officers Groups; completed nuclear safety design certification evaluation of the C-17A; issued nuclear compatibility certification statement for F-15E/B61; provided technical support for efforts to upgrade the use control devices on the strategic weapon systems, the F-15E Programmable Armament Control Set (PACS), B-1B Block E design for nuclear capability roll-in, and for the F-16A/B and PA-200 Tornado aircraft weapons system hardware/software update and upgrade; conducted nuclear weapon Aircraft Monitor and Control (AMAC) tests on the F-16C/D Modular Mission Computer upgrade and B-2A Block 20 modification; conducted B61-11 Mechanical Fit Test and B-61-11 Full System Demonstration Test; conducted evaluations of nuclear weapon system incidents; completed engineering analysis of load conditions on Nuclear Weapon Storage Vault (WSV) resulting from conventional explosive detonations within a Hardened Aircraft Shelter (HAS); verified the WE1841 Test Set software for the B-52H surveillance test program on the B-52H simulator; provided revisions, changes and updates to nuclear Weapons Technical Orders resulting from systems and weapons hardware/software changes; chaired Technical Order review, validation/verification, and technical content conferences.</p>									
Project 5708			Page 9 of 15 Pages			Exhibit R-2 (PE 0604222F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604222F Nuclear Weapons Support	5708
– (U) \$782	Nuclear Ground-Launched Missile (ICBM) Support. Supported START I and START II treaties during Minuteman III base transfers; provided nuclear surety design criteria, standards, specifications, and related requirements documents for all USAF ground-launched missile systems; provided nuclear surety design guidance to the ICBM program office/contractors for the Minuteman III Guidance Replacement Program , the Airborne Launch Control System (ALCS) transition to the Navy E6B Aircraft Program, Boeing Guidance Repair Center, ICBM Nuclear Safety Cross Check Analysis/Independent Validation & Verification contract proposal, Minuteman III Propulsion Replacement Program, ICBM Wing Code Processing System, Hardness Surveillance Electromagnetic Pulse Program, Explosive Set Circuitry Test Set, and Minuteman III Payload Transporter Type III; supported the Minuteman III System-Wide Unauthorized Launch Study (ULS) Working Group, the ULS Senior Steering Group, and the ICBM Nuclear Surety Working Group; conducted the Independent Technical Nuclear Safety Analysis for the ALCS Transition to the Navy E6B Aircraft Program for the Nuclear Weapon System Safety Group (NWSSG) Special Safety Study of the ALCS; and supported activities for resolutions of open ICBM Weapon System NWSSG recommendations.	
– (U) \$1,142	Nuclear Weapons Program Support. Accomplished nuclear weapon safety, reliability, mission analysis and compatibility studies including the 1996 Annual Certification Reports; supported stockpile activities including the W62 Life Extension Study, W62 Cost/Benefit/Risk Study, 90 Day W78 Life Extension Study, W87 Life Extension Program, W80 Life Extension Assessment, Hedge Analysis and Yield Assessment; completed weapon use control analyses for B61 and ICBM warheads and W80/W84 storage assessments; concluded interim certification on the B61-11 modification program; approved revisions to W80, B61 and B83 Military Characteristics and Stockpile-to-Target documents and finalized new documents for the B61-11 program; continued to manage the nuclear warhead project officer groups; continued the life extension assessment activities to examine current status, anticipated age-related degradation problems, estimated replacement need dates and likely problems due to sunset technology and changes to the DOE production complex; continued to develop plans for treaty driven stockpile reconfigurations (Single Reentry Vehicle/ Safety Enhanced Reentry Vehicle) and inactive stockpile plans; and initiated reliability testing assessment for W80 and B61.	
– (U) \$592	Nuclear Weapons/Systems Assessments. Performed analysis, testing and documentation of the Kirtland Underground Munitions Storage Complex’s (KUMSC) Blast Containment System for various facility configurations; completed the B-52 Positive Control IPT study and a probability assessment for inadvertent nuclear detonation for the B53-1 for ALT 925 and non-ALT 925 weapons; supported and researched the polywall structure and fragmentation issue in TP 20-7.	
– (U) \$400	Counterproliferation Assessments. Provided technical guidance and support for the Agent Defeat Weapon (ADW) Assessment of Alternatives (AoA) Study (DoD Phase 0); provided program guidance and technical expertise in the evaluation of nuclear, thermal, chemical, emitter and conventional systems identified as possible Agent Defeat concepts; performed weapon effectiveness assessments for nuclear and non-nuclear baseline and conceptual weapon alternatives; and provided collateral damage assessments of ADW baseline weapon systems.	
– (U) \$3,966	Total	
Project 5708	Page 10 of 15 Pages	Exhibit R-2 (PE 0604222F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604222F Nuclear Weapons Support	5708
<u>(U) FY 1998 (\$ in Thousands)</u>		
– (U) \$1,030	Nuclear Aircraft System Support. Continue FY 1997 level of effort: support the US Strategic Command’s nuclear safe escape effort; update/expand nuclear hardness database; conduct nuclear aircraft weapon system surveillance test program; provide technical support required by NWSSG action items, Special Safety Studies, and Operational Safety Reviews; perform independent engineering nuclear safety evaluations; support design, development, standardization and procurement of stores management systems for nuclear weapons command and control; provide nuclear surety and compatibility design criteria, standards, specifications, and related requirements documents for all USAF nuclear capable aircraft weapon systems; manage the B-52H, F-15E and B-2A POGs and Nuclear Airlift POG; perform an independent analysis of the B-2A Block 30 software; direct aircraft compatibility testing on the B-2A, B-52H and B-1B; perform independent engineering evaluations for nuclear safety design certification of nuclear weapon system modifications; perform engineering evaluations and support testing required for nuclear weapon compatibility certification; issue AF Nuclear Compatibility Certification Statements for the F-16C/D, B-52H, B-2A and B-1B; provide revisions, changes and updates to nuclear weapons Technical Orders resulting from systems and weapons hardware/software changes; chair Technical Order review, validation/verification, and technical content conferences.	
– (U) \$680	Nuclear Ground-Launched Missile (ICBM) Support. Continue FY 1997 level of effort: provide nuclear surety design criteria, standards, specifications, and related requirements documents for all USAF ground-launched missile systems; provide nuclear surety design guidance to ICBM program office/contractors for Minuteman III Guidance Replacement Program (GRP), the Minuteman III Propulsion Replacement Program, modification required for Peacekeeper Weapon System Sustainment, and other weapon system modification and upgrade programs; provide nuclear certification support; perform independent nuclear surety analyses for nuclear safety design certification of weapon system modifications and upgrade programs; provide AFMC NWSSG member, technical advisors and technical support to the ICBM NWSSG Operational Safety Review; and provide support for NWSSG Special Safety Studies as required.	
– (U) \$1,120	Nuclear Weapons Program Support. Continue FY 1997 level of effort: accomplish nuclear weapon safety, reliability, mission analysis and compatibility studies; support USAF nuclear weapon stockpile activities, weapon use control analyses and environmental and intrinsic radiation studies; continue life extension assessments to develop, plan, schedule and execute programs for safety, security, reliability and operability actions for B61, B83, W80 and ICBM warheads; continue to develop reconfiguration and inactive stockpile plans; complete the B61-11 program; continue support to USAF, DoD and other agencies in all facets of nuclear arsenal.	
– (U) \$700	Nuclear Weapons/Systems Assessments. Continue FY 1997 level of effort: begin to apply joint DoD/DOE nuclear surety assessment methodology on abnormal nuclear environments analyses ; conduct fault tree analyses of nuclear weapons and weapon systems; provide other special assessments as capable.	
– (U) \$250	Counterproliferation Assessments. Continue FY 1997 level of effort: Provide technical guidance and support for the ADW Assessment of Alternatives (AoA) Study; provide overall program guidance and technical expertise in the evaluation of nuclear, thermal, chemical, emitter and conventional systems identified as possible Agent Defeat concepts; provide continued analytical support of nuclear, non-nuclear and advanced weapon system concepts and assessing unique ADW intelligence and battle damage assessment (BDA) requirements.	
– (U) \$3,780	Total	
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604222F Nuclear Weapons Support	5708
<u>(U) FY 1999 (\$ in Thousands)</u>		
– (U) \$1,150	Nuclear Aircraft System Support. Continue FY 1998 level of effort: support the US Strategic Command’s nuclear safe escape effort; update/expand nuclear hardness database; conduct nuclear aircraft weapon system surveillance test programs; provide technical support required by NWSSG action items, Special Safety Studies, and Operational Safety Reviews; perform independent nuclear safety analyses; support design, development, standardization and procurement of stores management systems for nuclear weapons command and control; provide nuclear surety and compatibility design criteria, standards, specifications, and related requirements documents for all USAF nuclear capable aircraft weapon systems; manage the B-52H, F-15E, B-2A and Nuclear Airlift POGs; direct nuclear weapon aircraft interface testing on delivery aircraft as required; perform independent engineering evaluations for nuclear safety design certification of nuclear weapon system modifications; perform engineering evaluations and support testing required for nuclear weapon compatibility certification; provide revisions, changes and updates to nuclear weapon Technical Orders, resulting from system and weapon hardware/software changes; chair Technical Order review, validation/verification, and technical content conferences.	
– (U) \$770	Nuclear Ground-Launched Missile (ICBM) Support. Continue FY 1998 level of effort: provide nuclear surety design criteria, standards, specifications, and related requirements documents for all USAF ground-launched missile systems; provide nuclear surety design guidance to ICBM program office/contractors for weapon system modifications and upgrade programs, perform independent nuclear surety analyses for nuclear safety design certification of weapon system modifications; provide nuclear certification support; complete nuclear safety analysis for nuclear safety design certification of the Minuteman III GRP Program; and support NWSSG action items and Special Safety Studies as required.	
– (U) \$1,290	Nuclear Weapons Program Support. Continue FY 1998 level of effort: accomplish nuclear weapon safety, reliability, mission analysis and compatibility studies, support USAF nuclear weapon stockpile activities, weapon use control analyses; and environmental and intrinsic radiation studies; continue to develop, plan, schedule and execute nuclear weapon life extension programs for safety, security, reliability and operability actions for B61, B83, W80 and ICBM warheads; continue to develop reconfiguration and inactive stockpile plans; continue support to USAF, DoD and other agencies in all facets of nuclear arsenal.	
– (U) \$777	Nuclear Weapons/Systems Assessments. Continue FY 1998 level of effort: continue application of joint DoD/DOE nuclear surety assessment methodology to abnormal nuclear environment analyses; conduct fault tree analyses of nuclear weapons and weapon systems; provide other special assessments as capable.	
– (U) \$298	Counterproliferation Assessments. Continue FY 1998 level of effort: Provide technical guidance and support for the ADW AoA Phase 0 Study leading to a Milestone I decision fourth quarter FY98; provide overall program guidance and technical expertise in the evaluation of nuclear, thermal, chemical, emitter and conventional systems identified as possible Agent Defeat concepts; provide technical support for current, proposed and future counterproliferation efforts of interest to the USAF.	
– (U) \$4,285	Total	
Project 5708	Page 12 of 15 Pages	Exhibit R-2 (PE 0604222F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604222F Nuclear Weapons Support			PROJECT 5708		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Program Management Personnel				234	239	244			
(U)	Research Personnel				2,870	2,927	2,985			
(U)	Travel				275	275	325			
(U)	Training Development				150	150	175			
(U)	Research Support Equipment Acquisition				125	125	150			
(U)	Miscellaneous				312	64	406			
(U)	Total				3,966	3,780	4,285			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
SA-ALC/NWI	N/A	N/A	N/A	N/A	Cont	3,966	3,780	4,285	Cont	Cont
<u>Support and Management Organizations</u>										
None										
<u>Test and Evaluation Organizations</u>										
None										
Project 5708					Page 14 of 15 Pages			Exhibit R-3 (PE 0604222F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604222F Nuclear Weapons Support	PROJECT 5708
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property:

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u> None									
<u>Support and Management Property</u> None									
<u>Test and Evaluation Property</u> None									
Subtotal Product Development				Cont	3,966	3,780	4,285	Cont	Cont
Subtotal Support and Management				0	0	0	0	0	0
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				Cont	3,966	3,780	4,285	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604226F B-1B					
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	207,386	208,222	195,385	204,749	136,850	38,322	5,182	0	1,363,041
1019 ECM Improvements*	42,714	0	0	0	0	0	0	0	76,182
1020 AFMSS*	10,739	0	0	0	0	0	0	0	20,162
1021 B-1 Simulator*	5,418	0	0	0	0	0	0	0	9,416
4143 Conventional Weapons Upgrade*	148,515	0	0	0	0	0	0	0	468,571
4596 Conventional Mission Upgrade*	0	208,222	195,385	204,749	136,850	38,322	5,182	0	788,710
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* BPACs 1019, 1020, 1021, and 4143 were consolidated into BPAC 4596 beginning in FY98.

(U) **A. Mission Description and Budget Item Justification**

(U) With the drawdown of forward-based US ground, naval, and tactical air forces, current defense strategy calls for long range, conventionally armed strategic bombers to play a major role in the initial stages of a regional contingency. The 94 B-1B Lancers in the Air Force inventory will constitute over one-half of all US strategic bombers -- making them the centerpiece of the conventional bomber force well into the next century. To maximize the B-1's contribution in this role, the Air Force must enhance the B-1's capability to perform precision attacks against moderately defended targets deep in enemy airspace. The needed enhancements fall primarily into two categories: improved lethality through integration of advanced conventional weapons, and improved survivability through upgrades to the electronic countermeasures (ECM) system. The Air Force established the Conventional Mission Upgrade Program (CMUP) to fulfill these requirements.

(U) This Program Element provides RDT&E funding for CMUP. The program improves the B-1's effectiveness in conventional operations by integrating advanced conventional weapons. Required Assets Available (RAA) of Cluster Bomb Units (CBUs) was achieved in September 1996. Funding in the FYDP covers integration of the Joint Direct Attack Munition (JDAM), Wind Corrected Munitions Dispenser (WCMD), Joint Stand-Off Weapon (JSOW), Joint Air to Surface Stand-Off Missile (JASSM), and upgrades to the ECM suite. Parallel efforts include an upgrade to the avionics computers to enable simultaneous carriage of multiple weapon types (one type per bay), provide growth capability, and reduce support costs; development of an interface to the Air Force Mission Support System (AFMSS) for more effective employment of the B-1 in a theater scenario; and upgrades to the air crew and maintenance training systems to keep them consistent with the aircraft's configuration.

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604226F B-1B	
<p>The FY99 program includes work in Research Category/Budget Activity Engineering and Manufacturing Development structured in development blocks, as well as Live Fire Test and Evaluation, as follows:</p> <p>(U) Block C: Integration of CBUs (EMD completed in FY95, FOC 4QFY97). (Formerly Project 4143, Conventional Weapons Upgrade)</p> <p>(U) Block D: Aircraft enhancements include the JDAM integration effort, an anti-jam secure-voice radio (communications upgrade) for improved interoperability with other theater forces, a Mil-Std-1760 electrical interconnection system which provides a common interface between aircraft and precision weapons, and a Global Positioning System (GPS) receiver to provide position updates to precision weapons. SECAF accelerated procurement of JDAM modification kits for seven aircraft. ALE-50 (Towed Decoy System), currently managed under PE 0604270F, was accelerated in conjunction with JDAM to yield enhanced operational capability in FY99. (Formerly Project 4143, Conventional Weapons Upgrade)</p> <p>(U) Block E (Computer Upgrade and WCMD Integration Program): Includes an upgraded avionics computer suite which will significantly improve computer reliability and maintainability (projected \$40M O&S savings per year after full fleet modification) and improvements to handle advanced weapons requirements including integration of WCMD. (Formerly Project 4143, Conventional Weapons Upgrade)</p> <p>(U) Block E Delta: Develop necessary modifications to integrate JSOW and JASSM</p> <p>(U) Block F (Defensive System Upgrade Program (DSUP)): The existing ALQ-161 defensive system, designed for the strategic nuclear mission (i.e., low altitude penetration against specific air defense threats), has limited effectiveness in the B-1B's new conventional mission. DSUP will remove most of the ALQ-161 system and replace it with an upgraded AN/ALR-56M radar warning receiver and the RF Countermeasures (RFCM) portion of the Navy's IDECM program, which includes a techniques generator and a fiber optic towed decoy. These new systems will significantly improve situational awareness and the survivability of the B-1B in the medium and high altitude regimes where most conventional missions will be conducted. These enhancements are required to maximize the effectiveness of the new weapons capability provided under CMUP. Additionally, these modifications will eventually reduce annual O&S costs approximately \$50-60M per year after full fleet modification. (Formerly Project 1019, ECM Improvements)</p> <p>(U) Other CMUP Related Development: Studies and design definition for Data Link Implementation, EMD work associated with the congressional plus-up for additional Enhanced Conventional Bomb Module's (ECBM's), Intermediate Wing Sweep Studies and Verification, preliminary engineering and planning studies for potential future weapon system enhancements and weapon system operational support improvements.</p> <p>(U) B-1B Mission Planning System (MPS): Consists of improved B-1 mission planning capabilities by developing an aircraft specific software module to interface with the ongoing AFMSS program. While AFMSS provides common mission planning capabilities for all aircraft, the aircraft, weapons, and electronics (A/W/E) hardware and software on each type aircraft provide unique interfaces and functionality not provided by the AFMSS "core" system. The B-1 A/W/E module provides those aircraft unique interfaces to achieve enhanced route planning, penetration, and weapons delivery capabilities. AFMSS replaces the aging Mission Data Preparation System which is no longer fully supportable and does not meet current mission requirements. This A/W/E module will be developed concurrently with the AFMSS core software and the B-1 operational flight programs. Once the initial B-1 A/W/E is developed and fielded, it must continue to be updated to remain consistent with and provide capability for subsequent block developments. (Formerly Project 1020, AFMSS)</p> <p>(U) Training Systems: Provides updates to the existing training system necessary to match changes made to the aircraft described in the other sections. The total B-1 Training System consists of the Simulator System (SS) to train air crew members and Maintenance Training Equipment (MTE) to train maintenance personnel. The SS is a suite of systems which provides the necessary visual, motion, and aural cues for complete ground training of B-1 air crew members -- there are five</p>		
<i>Page 2 of 17 Pages</i>		Exhibit R-2 (PE 0604226F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	
5 - Engineering and Manufacturing Development	0604226F B-1B	
<p>Weapon System Trainers, five Cockpit Procedure Trainers, two Mission Trainers and one Training System Support Center (TSSC). The TSSC includes the computational system resources required to support software, hardware, and firmware changes. The MTE provides maintenance training for simulation of fault isolation and removal/replacement of all B-1 aircraft systems. The MTE, also a suite of systems, includes eight Avionics/Armament Maintenance Training Systems, 10 Simulator Maintenance Training Systems, one Primary/Secondary Flight Control System Maintenance Trainer and one TSSC to support software, hardware, and firmware changes. (Formerly Project 1021, B-1 Simulators)</p> <p>(U) <u>Acquisition Strategy:</u></p> <p>(U) These major upgrades will be accomplished and integrated in conjunction with ongoing sustainment block upgrades. RDT&E work on the Block C CBU upgrade was completed in FY95. Boeing North American (formerly Rockwell International, North American Aircraft Division) is the integrating contractor for all major aircraft upgrades. B-1 MPS and training system upgrades will be released periodically during the individual blocks.</p> <p>(U) Key elements of the overall CMUP acquisition strategy include: use of sole source contract with a prime/integrating contractor; assignment of Total System Installed Performance Responsibility (TSIPR) to the integrating contractor; use of cost plus award fee (CPAF) development contracts; and combining developmental upgrades with software sustainment blocks to minimize number of software releases, aircraft downtime and differences in fielded configurations.</p> <p>(U) The ten test articles purchased in FY97 (\$5,140) were computer set kits (six to be installed in labs to support Block E EMD, two for Block E test aircraft, one to be installed in the lab to support Block F EMD, and one for the DSUP test aircraft). The twelve test articles to be purchased in FY98 consist of seven computer set kits (\$3,598) (five to be installed in labs, and two as test spares) and five DSUP kits (\$5,418) to support Block F EMD (three in labs and two in aircraft). The three test articles to be purchased in FY00 consist of three JSOW/JASSM aircraft launcher kits to be installed in the lab and test aircraft.</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u> See Project R-2 Exhibit</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> See Project R-2 Exhibit</p> <p>(U) D. <u>Schedule Profile</u> See Project R-2 Exhibit</p>		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604226F B-1B	PROJECT 4596
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4596 Conventional Mission Upgrade*	0	208,222	195,385	204,749	136,850	38,322	5,182	0	788,710

*BPAC 4596 resulted from the consolidation of BPACs 1019, 1020, 1021, and 4143 beginning in FY98. In FY97 the total was \$207,386 and the total program cost is \$1,363,041.

(U) A. Mission Description and Budget Item Justification

(U) The B-1 will deliver most of the heavy bomber fleet's conventional weapons in future conflicts. The original B-1 conventional combat capability was optimized for delivery of MK-82 non-precision 500 pound gravity bombs. The increase in the B-1's conventional weapons employment capability involves upgrading the following systems:

- (U) CBUs: Modify 50 of the 101 existing B-1 conventional bomb modules to provide the capability to employ cluster bomb units (CBUs). The modified modules completed delivery 4QFY97.
- (U) GPS/Communications Navigation Management System/JDAM/Mil-Std-1760: Incorporate Global Positioning System (GPS) capability for more precise long range navigation, TACAN emulation, and weapons delivery. Integrate the ARC-210 "HAVE QUICK" secure/anti-jam communications system for improved capability to operate within force packages. Includes Voice Demand Assigned Multiple Access/Advanced Narrowband Digital Voice Terminal (DAMA/ANDVT), a SATCOM required communications upgrade. Also modifies the B-1 rotary launcher to accommodate carriage of JDAM and other advanced conventional weapons. Incorporates Mil-Std-1760 weapons interface for use with JDAM and other precision weapons.
- (U) Computers: Upgrade the current avionics computer complex to provide for weapons flexibility and reduce operation and support costs. Existing avionics computers will be replaced with modern, 32-bit hardware, and current software will be converted to Ada.
- (U) Wind Corrected Munitions Dispenser (WCMD): Add Mil-Std-1760 weapon interface to modified conventional bomb modules (see "CBUs" above) to allow B-1 to employ WCMD. Increases accuracy of CBUs when released at high altitudes, reducing target passes.
- (U) JSOW/JASSM: Develop necessary modifications to integrate JSOW and JASSM.
- (U) DSUP: Provides defensive system enhancements in: situational awareness, countermeasures effectiveness and reliability and maintainability

(U) Acquisition Strategy:

(U) The Conventional Mission Upgrade Program is managed in Blocks. In each Block, cost type contracts are used for EMD and fixed price contracts for production/mod kits:

- (U) Block C: Enhanced capability (but unguided) weapons (CBU-87/89/97) integration (Completed development in FY95)
- (U) Block D: Near precision weapons integration (JDAM/1760/GPS/Comm).
- (U) Block E: Upgrading of the avionics computers and integration of WCMD (CBU-103/104/105).
- (U) Block E Delta: Integrating JSOW and JASSM onto the aircraft.
- (U) Block F: Upgrade of defensive avionics system to include integration of AN/ALR-56M and IDECM RFCM system.

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604226F B-1B	4596
<p>(U) <u>Other CMUP Related Development</u> - Studies and design definition for Data Link Implementation, EMD work associated with the congressional plus-up for additional CBM's, Intermediate Wing Sweep Studies and Verification, preliminary engineering and planning studies for potential future weapon system enhancements and weapon system operational support improvements.</p> <p>(U) MPS: ESC/YV manages the B-1B Mission Planning development effort of the B-1 A/W/E, with ASC/YD retaining program management and funding authority for the program. Together, the organizations report to AFPEO/FB, the Program Executive Officer for Fighters and Bombers. The Government awarded a cost-plus-award-fee (CPAF) contract to Logicon for development of this A/W/E, using full-and-open competition and streamlined source selection. The Air Force plans a "single, combined release" of the B-1B Block C/D A/W/E software. This will provide the full functionality required for both the CBU (Block C) and JDAM/1760/GPS/Comm (Block D) upgrades. The single Block C/Block D combined release procurement goes through 3QFY98 with planned follow-on software development related to OFP changes for Blocks E and F and any evolving B-1 mission planning requirements through FY02.</p> <p>(U) Training Systems: The Simulator upgrade is funded through a 5-year contract awarded 21 Jun 94 to Lockheed-Martin Training & Technical Services. This contract encompasses development, production and Contractor Logistic Support (CLS) through FY99. The development portion is a cost-plus-award-fee (CPAF) type contract and production is firm-fixed-price (FFP). The CLS is fixed-price-award-fee (FPAF) for the simulator system and FFP for the maintenance training equipment. Time and Materials contracts will be used for over and above work on both the simulator system and MTE.</p> <p>(U) Government organizations responsible for various development efforts include: the B-1B System Program Office (SPO) and Training Systems SPO at ASC, Wright-Patterson AFB, OH; Oklahoma City Air Logistics Center (OC-ALC), Tinker AFB, OK; Warner Robins Air Logistics Center (WR-ALC), Robins AFB, GA; JDAM/JSOW/JASSM/WCMD SPO, Eglin AFB, FL; GPS Joint PO (JPO), Los Angeles AFB, CA; Mission Planning SPO at ESC, Hanscom AFB, MA; Rome Laboratories, Griffiss AFB, NY; Air Force Flight Test Center (AFFTC), Edwards AFB, CA; Air Force Developmental Test Center (AFDTC), Eglin AFB, FL; and Air Force Operational Test and Evaluation Center (AFOTEC), Kirtland AFB, NM.</p>		
Project 4596	Page 5 of 17 Pages	Exhibit R-2 (PE 0604226F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604226F B-1B	PROJECT 4596
(U) <u>FY 1997 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$5,239 (Other) Studies and design definition for data link implementation - (U) \$1,000 (Other) Began Intermediate Wing Sweep Studies - (U) \$79,513 (Block D) Continued integration for JDAM, 1760, GPS and Communications Navigation Management System - (U) \$32,186 (Block E) Continued EMD for Computer upgrade - (U) \$7,858 (Block E) Continued EMD for WCMD integration - (U) \$450 (Block E Delta) Continued ICD work on JSOW integration - (U) \$13,757 (Block F) Continued DSUP pre-EMD contractor systems engineering process, culminating in System Functional Review (SFR) - (U) \$23,555 (Block F) Began DSUP EMD - (U) \$9,899 (MPS) Continued Logicon contract - (U) \$80 (MPS) Contract support (Lockheed-Martin) - (U) \$95 (Training Systems) ACA with Logicon - (U) \$3,118 (Training Systems) MTE computer rehost - (U) \$188 (Training Systems) EMD WST Storage - (U) \$734 (Training Systems) Begin Block D development - (U) \$64 (Training Systems) IVACC Delay II - (U) \$14,737 Government flight test and planning - (U) \$4,483 GFE - (U) \$3,446 CAAS - (U) \$1,121 Modeling & Simulation / Studies & Analyses - (U) \$5,863 Program Management Administration - (U) \$207,386 Total 		
(U) <u>FY 1998 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$1,900 (Other) EMD work to integrate additional CBM's - (U) \$1,995 (Other) Complete Intermediate Wing Sweep Studies - (U) \$40,718 (Block D) Continue integration activities for JDAM, 1760, GPS and Communications Navigation Management System - (U) \$43,790 (Block E) Continue EMD for Computer upgrade - (U) \$9,613 (Block E) Continue EMD for WCMD integration - (U) \$7,200 (Block E Delta) Conduct acquisition & interface planning to support FY99 EMD start for JSOW & JASSM integration - (U) \$47,500 (Block F) Continue DSUP EMD activities - (U) \$9,897 (MPS) Continue Logicon contract - (U) \$150 (MPS) Continue Lockheed Martin contract 		
Project 4596	Page 6 of 17 Pages	Exhibit R-2 (PE 0604226F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		PROJECT
5 - Engineering and Manufacturing Development		4596
PE NUMBER AND TITLE		
0604226F B-1B		
<ul style="list-style-type: none"> - (U) \$4,215 (Training Systems) Continue Block D development - (U) \$1,399 (Training Systems) Continue MTE computer rehost - (U) \$3,204 GFE - (U) \$21,617 Government flight test - (U) \$2,632 ECO - (U) \$2,920 CAAS - (U) \$1,370 Modeling & Simulation / Studies & Analyses - (U) \$5,303 Mission Support - (U) \$2,799 Pending reprogramming to higher AF priority programs - (U) \$208,222 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$200 (Other) Complete EMD work to integrate additional CBM's - (U) \$350 (Other) Complete Intermediate Wing Sweep Studies and Verification - (U) \$5,100 (Block D) Complete integration activities for JDAM, 1760, GPS and Communications Navigation Management System - (U) \$43,632 (Block E) Continue EMD for Computer upgrade - (U) \$9,569 (Block E) Continue EMD for WCMD integration - (U) \$16,957 (Block E Delta) Begin EMD for JSOW & JASSM integration - (U) \$61,666 (Block F) Continue DSUP EMD activities - (U) \$9,636 (MPS) Continue Logicon contract - (U) \$150 (MPS) Continue Lockheed-Martin support - (U) \$9,058 (Training Systems) Continue Block D development - (U) \$930 GFE - (U) \$23,451 Government flight test - (U) \$4,003 ECO - (U) \$3,146 CAAS - (U) \$2,500 Modeling & Simulation / Studies & Analyses - (U) \$5,037 Mission Support - (U) \$195,385 Total 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		PE NUMBER AND TITLE 0604226F B-1B		PROJECT 4596
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	207,930	216,886	199,718	1,388,757
(U) Appropriated Value	217,732	220,886		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-4,644	-7,609		
b. SBIR	-5,158	-5,055		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-200			
e. Rescissions	-344			
(U) Adjustments to Budget Years Since FY 1998 PB			-4,333	
(U) Current Budget Submit/FY1999 President's Budget	207,386	208,222	195,385	1,363,042
 (U) Change Summary Explanation:				
Funding:				
(U) FY99 (-4,333): Funding was aligned with the current estimate for DSUP SCP (+1,007), Delay JSOW/JASSM EMD (-1,400)				
 Schedule: None				
 Technical: None				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604226F B-1B	PROJECT 4596
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) PE 0101126F, Aircraft Procurement (B-1); BP11, Modifications (CMUP-related only)	51,683	62,400	75,147	108,700	89,381	152,429	144,546	311,818	852,939
(U) PE 0101126F, Other Procurement (B-1)	32,000								32,000
(U) PE 0207442F, EW Production (TDS/IDECM)	3,700	21,825	0	0	6,859	8,568	7,502	25,500	91,254

- Related RDT&E:**
- (U) Program Element 0205164F, Global Positioning System (GPS)
 - (U) Program Element 0207325F, Joint Air to Surface Standoff Missile (JASSM)
 - (U) Program Element 0604618F/N, Joint Direct Attack Munition (JDAM)
 - (U) Program Element 0604727F/N, Joint Stand-Off Weapon (JSOW)
 - (U) Program Element 0604754F, Joint Tactical Information Distribution System (JTIDS)
 - (U) Program Element 0604600F, Wind Corrected Munitions Dispenser (WCMD)
 - (U) Program Element 0208006F, Air Force Mission Support System (AFMSS)
 - (U) Program Element 604270F, Electronic Warfare (EW) Development
 - (U) Program Element 305164F, Global Positioning System (GPS)

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604226F B-1B					PROJECT 4596		
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
DSUP												
(U) Acquisition Milestones												
(U)		*										
(U) Engineering Milestones												
(U)		*										
(U)				*								
(U)					X							
(U)								X				
(U) T&E Milestones												
(U)								X				
(U) Contract Milestones												
(U)			*									
Mission Planning System												
(U) Engineering Milestones												
(U)								X				
(U)									X			
(U) T&E Milestones												
(U)						X						
(U)						X						
(U) Contract Milestones												
(U)							X					

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development						PE NUMBER AND TITLE 0604226F B-1B					PROJECT 4596	
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
Training Systems												
(U) Acquisition Milestones												
(U) - Start CPT rehost			*									
(U) - Start EMD - Block D						X						
(U) - Start Production - MTE rehost							X					
(U) - MTE rehost delivery										X		
(U) Engineering Milestones												
(U) Block D												
(U) - SRR								X				
(U) - PDR									X			
(U) - CDR										X		
(U) Contract Milestones												
(U) - CPT rehost award			*									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604226F B-1B					PROJECT 4596		
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
Weapons												
(U) Acquisition Milestones												
(U) - Block C FOC			*									
(U) - Block D Comm/Nav MSIII				*								
(U) - Block D JDAM/1760 LRIP								X				
(U) - Block D JDAM/1760 MS III									X			
(U) - Block D RAA (GPS/Comm/ JDAM/1760)									X			
Weapons												
(U) Engineering Milestones												
(U) - Block E SFR (Computer/WCMD)	*											
(U) - Block E SSR (Computer/WCMD)		*										
(U) - Block E PDR (Computer/WCMD)					*							
(U) - Block E CDR (Computer/WCMD)								X				
(U) T&E Milestones												
(U) - Start Block D GPS/Comm/ JDAM/1760 Flight Test				*								
(U) - Complete GPS/Comm/ JDAM/1760 Flight Test								X				
(U) Contract Milestones												
(U) - Block E EMD (Computer/WCMD)		*										
(U) - Block D Production (GPS/Comm - Group A/B) [Lot 1]				*								

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604226F B-1B	PROJECT 4596
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	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) - Block D Production (GPS/Comm GFE Long Lead) [Lot 1/LRIP # 1]		*										
(U) - Block D Production (JDAM/1760/ GPS/Comm) [Lot 1/LRIP # 1]			*									
(U) - Block D Production (GPS/Comm) (Lot 2)						X						
(U) - Block D LRIP #2 (JDAM/1760)							X					
(U) - Block D Production (JDAM/1760) [Lot 1]									X			
(U) - Block E Delta EMD (JSOW/JASSM)									X			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	
BUDGET ACTIVITY		PROJECT	
5 - Engineering and Manufacturing Development		0604226F B-1B	
		February 1998	
		4596	
(U) A. Project Cost Breakdown (\$ in Thousands)			
(U) DSUP	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Risk Reduction/Evaluation	13,757		
(U) EMD	23,555	47,500	61,666
(U) Mission Planning System			
(U) Contract Funding	9,979	10,047	9,786
(U) Training Systems			
(U) IVACC Delay II	64		
(U) ACA with Logicon	95		
(U) WST EMD Storage	188		
(U) MTE Computer Rehost	3,118	1,399	
(U) Block D Development	734	4,215	9,058
(U) Weapons			
(U) Block D (JDAM/GPS/Comm/1760)	79,513	40,718	5,100
(U) Computer	32,186	43,790	43,632
(U) WCMD	7,858	9,613	9,569
(U) JSOW / JASSM	450	7,200	16,957
(U) Data Link Studies	5,239		
(U) Additional CBM Studies		1,900	200
(U) Intermediate Wing Sweep Studies	1,000	1,995	350
(U) Government flight test	14,737	21,617	23,451
(U) GFE	4,483	3,204	930
(U) ECO		2,632	4,003
(U) CAAS	3,446	2,920	3,146
(U) Modeling & Simulation / Studies & Analyses	1,121	1,370	2,500
(U) OGC/Mission Support	5,863	5,303	5,037
(U) Pending reprogramming		2,799	
(U) Total	207,386	208,222	195,385
Project 4596	Page 14 of 17 Pages	Exhibit R-3 (PE 0604226F)	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604226F B-1B			PROJECT 4596		
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
(U) DSUP										
(U) BNA	SS/CPAF	May 93	33,958	33,958	20,201	13,757	0	0	0	33,958
(U) BNA	SS/CPAF	June 97	218,530	218,530	0	23,555	47,500	61,666	85,809	218,530
(U) Mission Planning System										
(U) Logicon ¹	CPAF	Aug 94	44,920	44,920	6,718	9,899	9,897	9,636	8,770	44,920
(U) Lockheed-Martin	CPAF	Dec 95	1,314	1,314	484	80	150	150	450	1,314
(U) Training Systems										
(U) Lockheed-Martin	C/CPAF	Jun 94	50,911	50,911	3,711	4,199	5,614	9,058	28,329	50,911
(U) Weapons										
(U) BNA - CBUs	SS/CPFF	93	4,960	4,960	4,960	0	0	0	0	4,960
(U) BNA - CBUs	SS/CPFF	Jan 94	18,509	18,509	18,509	0	0	0	0	18,509
(U) BNA-Link 16	TBD	TBD	5,239	5,239	0	5,239	0	0	0	5,239
(U) BNA- Block D Pre-EMD	SS/CPFF	Aug 93	84,049	84,049	84,049	0	0	0	0	84,049
(U) BNA- Block D	SS/CPAF	Mar 95	269,654	269,654	144,323	79,513	40,718	5,100	0	269,654
(U) BNA-CBM	SS/CPAF	TBD	2,100	2,100	0	0	1,900	200	0	2,100
(U) BNA-Wing Sweep	SS/CPAF	Jul 97	3,345	3,345	0	1,000	1,995	350	0	3,345
Project 4596			Page 15 of 17 Pages				Exhibit R-3 (PE 0604226F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604226F B-1B				PROJECT 4596	
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
(U) BNA-Computer	SS/CPAF	Feb/Jul 97	176,493	176,493	14,101	32,186	43,790	43,632	42,784	176,493
(U) BNA-WCMD	SS/CPAF	Feb/Jul 97	38,686	38,686	2,255	7,858	9,613	9,569	9,391	38,686
(U) Lockheed-Martin / QT	C/CPAF	Jun 94	3,631	3,631	3,631	0	0	0	0	3,631
(U) TBD- JSOW/ JASSM	SS/CPAF	Sep 98	74,922	74,922	218	450	7,200	16,957	50,097	74,922
<u>Support and Management Organizations</u>										
(U) CAAS	Various	Annual	32,276	32,276	11,664	3,446	2,920	3,146	11,100	32,276
(U) Studies & Analyses / Modeling & Sim	Various	Various	26,094	26,094	12,103	1,121	1,370	2,500	9,000	26,094
(U) Mission Support	Various	Various	51,790	51,790	14,715	5,863	5,303	5,037	20,872	51,790
(U) ECO	Various	Various	32,865	32,865	79	0	2,632	4,003	26,151	32,865
(U) Reprogram	N/A	N/A	2,799	2,799	0	0	2,799	0	0	2,799
<u>Test and Evaluation Organizations</u>										
(U) DSUP										
(U) AFFTC	P.O.	Various	66,892	66,892	508	856	3,231	7,581	54,716	66,892
(U) Weapons										
(U) AFFTC	P.O.	Various	108,313	108,313	23,952	13,881	18,386	15,870	36,224	108,313

¹NOTE: Funded under the AFMSS Program, Program Element 0208006F in FY94 and FY95. Funded under the JDAM program, Program Element 0604618F in FY95.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604226F B-1B			PROJECT 4596		
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>									
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
(U) DSUP									
(U) Various	Various	Various	Various	0	3,491	2,310	108	593	6,502
(U) Training Sys									
(U) Various	Various	Various	Various	0	199	0	0	0	199
(U) Weapons									
(U) Various	Various	Various	Various	764	793	894	822	817	4,090
<u>Support and Management Property</u>									
<u>Test and Evaluation Property</u>									
Subtotal Product Development				303,924	182,219	171,581	157,248	227,040	1,042,012
Subtotal Support and Management				38,561	10,430	15,024	14,686	67,123	145,824
Subtotal Test and Evaluation				24,460	14,737	21,617	23,451	90,940	175,205
Total Project				366,945	207,386	208,222	195,385	385,103	1,363,041
Project 4596				Page 17 of 17 Pages			Exhibit R-3 (PE 0604226F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604227F Flight Simulator Development
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	4,241	4,061	1,961	3,904	3,889	3,871	3,854	Continuing	Continuing
2325 Simulator Development Activities	1,393	1,420	0	0	0	0	0	0	44,068
2769 Simulator Update Development	2,848	2,641	0	0	0	0	0	0	48,292
4673 Distributed Mission Training (DMT)	0	0	1,961	3,904	3,889	3,871	3,854	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** This is a continuing program element for development of aircrew and maintenance training techniques and devices. Objectives are to adapt simulation technology and standards developed by the laboratories and industry to satisfy MAJCOM training requirements and to develop prototype training devices. This program element is included in Budget Activity 5 - Engineering and Manufacturing Development (EMD) because it is devoted to the EMD of aircrew and maintenance training systems.

(U) **B.** Beginning in FY99, Distributed Mission Training (DMT) will become this PE's principal effort. DMT is an Air Force simulator modernization program that will network geographically-separated, high fidelity aircraft simulators with other battlefield systems (AWACS, JSTARS, C4I, etc.) into a real-time "synthetic battlefield." The envisioned end-state is a virtual network of training systems which will allow "high end" training not possible in today's simulators and very difficult to achieve in the aircraft because of peacetime safety of flight limitations, limited range availability, etc. DMT's focus is to provide a networked combat mission rehearsal training capability to the warfighters at home station. This encompasses dissimilar aircraft simulators being able to practice the necessary critical timing aspects and complex maneuvers for operations such as first air strike packages in future conflicts.

(U) **Acquisition Strategy:** Maximize the use of free and open competitive awards. Mission support efforts use a variety of contract vehicles. Specific programs use contract types appropriate to the work to be performed. Applies to all projects.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE			
							February 1998			
BUDGET ACTIVITY				PE NUMBER AND TITLE						
5 - Engineering and Manufacturing Development				0604227F Flight Simulator Development						
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>				
						<u>Cost</u>				
(U)	Previous President's Budget (FY1998 PB)	4,247	4,305	4,422		Continuing				
(U)	Appropriated Value	4,439	4,305							
(U)	Adjustments to Appropriated Value									
	a. Congressional/General Reductions	-117	-204							
	b. SBIR	-74	-40							
	c. Omnibus or Other Above Threshold Reprogram									
	d. Below Threshold Reprogramming									
	e. Rescissions	-7								
(U)	Adjustments to Budget Years Since FY 1998 PB			-2,461						
(U)	Current Budget Submit/1999 President's Budget	4,241	4,061	1,961		Continuing				
 (U) Change Summary Explanation:										
Funding: Changes in FY97 and FY98 include Congressional/general reductions, SBIR, and rescissions. FY99 and beyond change program direction from generic simulator development and support to Distributed Mission Training (DMT) development. FY98 and beyond reflect inflation rate changes.										
Schedule: Projects 2325 and 2769 terminated in FY98.										
Technical: FY99 and beyond change program direction from generic simulator development and support to DMT development.										
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U)	PE 0207130F, F-15 Squadrons	0	0	23,162	34,687	28,308	31,839	42,184	cont	cont
	Appropriation: O&M, AF									
(U)	PE 0207417F, AWACS Squadron	0	0	575	3,519	3,605	3,609	3,707	cont	cont
	Appropriation: O&M, AF									

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
0604227F Flight Simulator Development

(U) D. Schedule Profile

See individual project R-2 Exhibits for schedule profiles

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604227F Flight Simulator Development				PROJECT 2325				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2325 Simulator Development Activities				1,393	1,420	0	0	0	0	0	0	44,068
Quantity of RDT&E Articles				0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** This project supports engineering development of new aircraft and maintenance training technologies and standards. Funds the pre-production of first article training devices to satisfy the customer's training requirements. Efforts currently planned or underway include evaluation and development of networked multi-ship mission trainer capability using artificial intelligence techniques in the development of a generic Intelligent Training Management System (ITMS) and an evaluation of cutting-edge technology for training will also be developed.

(U) FY 1997 (\$ in Thousands):

- (U) 100 Developed visual and radar databases and standards
- (U) 300 Continued evaluation support for SMART 2000 and visual systems
- (U) 330 Completed evaluation of improved G-suit/G-seat/sensory simulation capability
- (U) 304 Continued development of Technology Roadmap
- (U) 300 Completed subjective transfer training
- (U) 59 Mission support
- (U) \$1,393 Total

(U) FY 1998 (\$ in Thousands):

- (U) 100 Continue development of visual and radar database and standards
- (U) 505 Continue evaluation of visual systems
- (U) 240 Define user training tasks for multi-ship mission training environments
- (U) 320 Perform long-haul networking studies and analysis
- (U) 100 Identify and define training device data models and software
- (U) 100 Continue development of the Technology Roadmap
- (U) 55 Mission support
- (U) \$1,420 Total

(U) FY 1999 (\$ in Thousands):

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		PE NUMBER AND TITLE 0604227F Flight Simulator Development		PROJECT 2325
- (U) \$0 Total				
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY1998 PB)	1,393	1,515	1,357	Continuing
(U) Appropriated Value	1,461	1,515		
(U) Adjustments to Appropriated Value				
a. Congressional Reductions	-44	-95		
b. SBIR	-24			
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Recissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-1,357	
(U) Current Budget Submit/1999 President's Budget	1,393	1,420	0	44,068
(U) Change Summary Explanation:				
Funding: FY97 & FY98 include Congressional/general reductions and SBIR. FY99 and beyond change program direction from generic simulator development and support to DMT development.				
Schedule: Project 2325 terminated effective FY99.				
Technical: FY99 and beyond change program direction from generic simulator development and support to DMT development.				
(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> Not Applicable				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604227F Flight Simulator Development	PROJECT 2325
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) SMART 2000 Integration and Documentation				*								
(U) Prototype Training System SMART 2000 and Visual Systems				X					*			
(U) Technology Roadmap				X					*			
(U) G-Suit/G-Seat Sensory Simulation				X								
(U) Visual and Radar Database Standards				X					*			
(U) Multi-ship Mission Training Environment										X		
(U) Long-Haul Studies and Analysis										X		
(U) Training Device Models and Software										X		

X Denotes milestone start
* Denotes milestone completion

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604227F Flight Simulator Development			PROJECT 2325			
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Long-Haul Studies				0	320	0				
(U) Visual and Radar Data Standard				100	100	0				
(U) Training Device Models and Software				0	100	0				
(U) Simulator Training Transfer				300	0	0				
(U) SMART 2000 and Visual Systems				300	505	0				
(U) Universal Threat Simulator				0	0	0				
(U) Technical Support				0	0	0				
(U) Technology Roadmap				304	100	0				
(U) G-Suit/G-Seat/Sensory Simulation				330	0	0				
(U) Multi-Ship Mission Training				0	240	0				
(U) Low Cost Helmet-Mounted Display				0	0	0				
(U) Network Evaluation				0	0	0				
(U) Mission Support				59	55	0				
(U) Total				1,393	1,420	0				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Numerous	Various	Various	N/A	N/A	41,068	1,334	1,365	0	0	43,767
Project 2325			Page 7 of 17 Pages				Exhibit R-3 (PE 0604227F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604227F Flight Simulator Development					PROJECT 2325
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
Training Systems Program Office, ASC, WPAFB	Various	Various	0	0	187	59	55	0	0	301
<u>Test and Evaluation Organizations:</u> Not Applicable										
Government Furnished Property: None										
Subtotal Product Development					41,068	1,334	1,365	0	0	43,767
Subtotal Support and Management					187	59	55	0	0	301
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					41,255	1,393	1,420	0	0	44,068

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604227F Flight Simulator Development				PROJECT 2769		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2769	Simulator Update Development	2,848	2,641	0	0	0	0	0	0	48,292
Quantity of RDT&E Articles		0	0	0	0	0	0	0	0	0
<p>(U) A. <u>Mission Description and Budget Item Justification</u> This project provides critical Training System Product Group (TSPG) support for user commands' products to include F-16 Weapon System Trainer, B-1B conventional upgrade, Simulator for Electronic Combat Training (SECT), C-17 training suite, Universal Training Device, and C-141 Aircrew Training System. These support systems include a computer center, communications, Advisory and Assistance Services (A&AS) contracting, travel, supplies, specialized training, and equipment.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 485 Travel - (U) 40 Communications - (U) 86 Training - (U) 645 A&AS - (U) 765 Management - (U) 383 Computer Center - (U) 148 Supplies - (U) 102 Equipment - (U) 194 Miscellaneous - (U) \$2,848 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 526 Travel - (U) 55 Communications - (U) 140 Training - (U) 700 A&AS - (U) 644 Management - (U) 195 Supplies - (U) 147 Equipment - (U) 234 Miscellaneous 										
Project 2769			Page 9 of 17 Pages				Exhibit R-2 (PE 0604227F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604227F Flight Simulator Development	PROJECT 2769																																																							
<p>– (U) \$2,641 Total</p> <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <p>– (U) \$0 Total</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998 PB)</td> <td style="text-align: center;">2,854</td> <td style="text-align: center;">2,790</td> <td style="text-align: center;">3,065</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">2,978</td> <td style="text-align: center;">2,790</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Congressional/General Reductions</td> <td style="text-align: center;">-73</td> <td style="text-align: center;">-109</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: center;">-50</td> <td style="text-align: center;">-40</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td style="text-align: center;">-7</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-3,065</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/1999 President's Budget</td> <td style="text-align: center;">2,848</td> <td style="text-align: center;">2,641</td> <td style="text-align: center;">0</td> <td style="text-align: center;">48,292</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: FY97 and FY98 include Congressional/general reductions, SBIR, and rescissions. FY99 and beyond change program direction from generic simulator development and support to Distributed Mission Training (DMT) development.</p> <p style="padding-left: 20px;">Schedule: Project 2769 terminated effective FY99.</p> <p style="padding-left: 20px;">Technical: FY99 and beyond change program direction from generic simulator development and support to DMT development.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> Not Applicable</p> <p>(U) D. <u>Schedule Profile:</u> Not Applicable. Level of effort task.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY1998 PB)	2,854	2,790	3,065	Continuing	(U) Appropriated Value	2,978	2,790			(U) Adjustments to Appropriated Value					a. Congressional/General Reductions	-73	-109			b. SBIR	-50	-40			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions	-7				(U) Adjustments to Budget Years Since FY 1998 PB			-3,065		(U) Current Budget Submit/1999 President's Budget	2,848	2,641	0	48,292
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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(U) Adjustments to Budget Years Since FY 1998 PB			-3,065																																																						
(U) Current Budget Submit/1999 President's Budget	2,848	2,641	0	48,292																																																					
Project 2769	Page 10 of 17 Pages	Exhibit R-2 (PE 0604227F)																																																							

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604227F Flight Simulator Development	PROJECT 2769
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Travel	485	526	0
(U) Communications	40	55	0
(U) Training	86	140	0
(U) A&AS	645	700	0
(U) Management	765	644	0
(U) Computer Center	383	0	0
(U) Supplies	148	195	0
(U) Equipment	102	147	0
(U) Miscellaneous	194	234	0
(U) Total	2,848	2,641	0

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Product Development Organizations: Not Applicable										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604227F Flight Simulator Development					PROJECT 2769
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
Training System Program Office (SPO) ASC, WPAFB OH	Various	Various	N/A	N/A	42,803	2,848	2,641	0	0	48,292
<u>Test and Evaluation Organizations:</u> Not Applicable										
Government Furnished Property: None										
Subtotal Product Development					0	0	0	0	0	0
Subtotal Support and Management					42,803	2,848	2,641	0	0	48,292
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					42,803	2,848	2,641	0	0	48,292

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604227F Flight Simulator Development				PROJECT 4673	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4673 Distributed Mission Training (DMT)	0	0	1,961	3,904	3,889	3,871	3,854	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification** Distributed Mission Training (DMT) will revolutionize air and space team training by implementing a "train the way you fight" philosophy. This program will allow the Air Force to conduct full mission training, which can only be done to a limited extent today due to constraints on flying hours, platform and airspace availability, and environmental constraints. DMT will network geographically-separated aircraft simulators, C4I assets, and other battlefield systems and trainers in a "synthetic battlefield environment." DMT operations will be conducted using Operations and Maintenance funds. Engineering Development efforts will focus on development, demonstration, and transitioning of enhancements of critical functions associated with the DMT network and linked simulators. Areas of emphasis include development and demonstration of network architectures, common databases and database interfaces, improved simulator fidelity, and integration with constructive simulations for C4I. The ultimate objective of the program is to expand DMT to be able to conduct full joint and combined forces mission rehearsals.

(U) FY 1997 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1999 (\$ in Thousands):

- (U) 961 Development and implemenation of the DMT network to include standards development, multilevel security and latency management approaches, integration of dissimiliar aircraft, command and control systems, intel systems, constructive model simulators, and legacy systems
- (U) 500 Development and integration of a common network database architecture, and implementation of database interfaces
- (U) 500 Demonstration and testing of technologies to improve image generation fidelity across the DMT network
- (U) \$1,961 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604227F Flight Simulator Development				PROJECT 4673		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>				
		0	0	0		<u>Cost</u>			0	
(U) Previous President's Budget (FY1998 PB)										
(U) Appropriated Value										
(U) Adjustments to Appropriated Value										
a. Congressional/General Reductions										
b. SBIR										
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming										
e. Rescissions										
(U) Adjustments to Budget Years Since FY 1998 PB				1,961						
(U) Current Budget Submit/1999 President's Budget		0	0	1,961			Continuing			
(U) Change Summary Explanation:										
Funding: FY99 funding initiates DMT program.										
Schedule: N/A										
Technical: N/A										
(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> N/A										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
(U) PE 0207130F, F-15 Squadrons		0	0	23,162	34,687	28,308	31,839	42,184	Compl	Cost
Appropriation: O&M, AF									cont	cont
(U) PE 0207417F, AWACS Squadron		0	0	575	3,519	3,605	3,609	3,707	cont	cont
Appropriation: O&M, AF										

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604227F Flight Simulator Development	PROJECT 4673
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) F-15 Four Ship Operations begin at Eglin AFB											X	
(U) F-15 Four Ship Operations begin at Langley AFB												X
(U) DMT Integration & Operations begin											X	
(U) AWACS ops begin :Tinker AFB, OK											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604227F Flight Simulator Development			PROJECT 4673		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	DMT Network Architecture Development				0	0	961			
(U)	Common database and interface integration				0	0	500			
(U)	Demonstration of improved simulator/network fidelity				0	0	500			
(U)	Total				0	0	1,961			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
TBD	CPAF/FPAT (for development) FFP/FPAT (for operations)	Jun 99 (estimated)	TBD	TBD	0	0	0	1,761	continuing	continuing
<u>Support and Management Organizations</u>										
Training Systems Product Group			N/A	N/A	0	0	0	200	continuing	continuing
Project 4673			Page 16 of 17 Pages				Exhibit R-3 (PE 0604227F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604227F Flight Simulator Development				PROJECT 4673	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>										
<u>Test and Evaluation Organizations:</u> Not Applicable										
Government Furnished Property: Not Applicable										
Subtotal Product Development					0	0	0	1,761	continuing	continuing
Subtotal Support and Management					0	0	0	200	continuing	continuing
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					0	0	0	1,961	continuing	continuing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	63,975	67,866	55,563	35,759	22,280	1,937	2,035	0	332,233
4102 Joint Primary Aircraft Training System (JPATS)	41,091	54,890	44,373	34,218	22,280	1,937	2,035	0	268,693
4376 T-38 Avionics Upgrade program (AUP)	22,884	12,976	11,190	1,541	0	0	0	0	63,540
Quantity of RDT&E Articles	*2/12,700	0	0	0	0	0	0	0	*4/174,271

(U) * Note: The quantity of RDT&E articles shown above includes two T-38 AUP aircrew training devices (\$12,700K in FY97). It also includes the JPATS test aircraft (T-1) funded with FY95 through FY00 funds and one set of Ground Based Training System (GBTS) simulators funded with FY97 through FY01 funds (\$161,571K total).

(U) **A. Mission Description and Budget Item Justification**

Supports Air Education and Training Command's (AETC) implementation of Specialized Undergraduate Pilot Training (SUPT) and the Department of Defense initiative for joint pilot training. The Joint Primary Aircraft Training System (JPATS) is a joint USAF/USN venture to replace the Services' fleets of primary trainer aircraft (T-37 and T-34 respectively) and associated Ground Based Training Systems (GBTS). The Air Force is the Executive Service. The T-38 Avionics Upgrade Program (AUP) is an integrated modernization of the T-38 and AT-38 cockpits to support mission ready bomber/fighter training. This program is in Budget Activity 5, Engineering and Manufacturing Development, because it primarily involves the missionization of commercial derivative aircraft, equipment, and components.

(U) **Acquisition Strategy:**

Each acquisition has been competitively awarded with the intent of maximizing the use of commercially available equipment and best commercial practices. The JPATS Program competitively awarded two contracts: a firm fixed price contractor logistics support (CLS) contract and a fixed price incentive firm manufacturing development (MD)/production contract with seven options. The T-38 AUP competitively awarded three contracts to a single prime: a) a cost plus award fee EMD contract with six firm fixed price production options; b) a firm fixed price CLS contract for avionics including Contractor Owned and Maintained Base Supply (COMBS); and c) a fixed price award fee maintenance contract for the current and new Aircrew Training Devices (ATDs).

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	75,680	80,238	67,183	401,578
(U) Appropriated Value	79,260	72,238		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,682	-2,675		
b. SBIR	-1,898	-1,697		
c. Omnibus or Other Above Threshold Reprogram	-11,575			
d. Below Threshold Reprogramming				
e. Rescissions	-130			
(U) Adjustments to Budget Years Since FY1998 PB			-11,620	
(U) Current Budget Submit/1999 President's Budget	63,975	67,866	55,563	332,233

(U) Change Summary Explanation:

Funding: FY97 and FY98 include Congressional/general reductions, SBIR, reprogrammings, and rescissions. JPATS adjustments in FY99 are based on Ground Based Training System (GBTS) contractor cost proposals that were lower than anticipated and to Air Force funding availability. JPATS "to complete" funding decreases due to a shift of mission support costs from RDT&E to Aircraft Procurement. FY99 T-38 AUP is increased for higher than anticipated contractor and Flight Test Center cost. FY99 and "to complete" reflect inflation rate changes.

Schedule: JPATS first flight slipped from Mar to May 98 due to manufacturing process delays. Air Force acceptance (DD 250) of JPATS aircraft T-1 will slip as well. As a result of FY99 funding reductions, JPATS Training Integration Management System (TIMS) development is impacted, which causes Air Force Milestone III to slip to 2QFY00.

Technical: N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng					
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) <u>Aircraft Procurement, Air Force</u>									
JPATS, BA-3	66,866	75,878	107,086	85,500	100,561	217,437	255,035	663,500	1,670,063
JPATS, BA-6							62,511	59,607	122,118
(U) <u>Military Construction, Air Force</u>									
PE 0804741F, JPATS	0	2,470	0	3,200	0	0	3,200	7,700	16,570
(U) <u>RDT&E, Navy, BA-7</u>									
PE 0603208N, Training System Aircraft, H1150, JPATS	1,834	391	595	316	0	0	0	0	11,531
(U) <u>Aircraft Procurement, Navy</u>									
JPATS, BA-3	0	0	0	33,294	80,104	81,452	83,359	1,373,700	1,651,909
APN 6 Spares	0	0	0	0	0	0	21,642	128,100	149,742
(U) <u>Military Construction, Navy</u>	0	0	0	9,300	1,500	600	1,300	11,617	24,317
(U) <u>Aircraft Procurement, Air Force</u>									
T-38 Avionics Upgrade, BP1100	0	0	38,068	95,684	92,349	87,025	105,138	168,927	587,191
 (U) D. <u>Schedule Profile</u>									
See individual project R-2 Exhibits for schedule profiles									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng				PROJECT 4102				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4102	Joint Primary Aircraft Training System (JPATS)			41,091	54,890	44,373	34,218	22,280	1,937	2,035	0	268,693
Quantity of RDT&E Articles				0	0	0	0	0	0	0	0	2*\$161,571
<p>* Note: JPATS test aircraft (T-1) funded with FY95 through FY00 funds and one set of Ground Based Training System (GBTS) simulators funded with FY97 through FY01 funds (\$161,571K total).</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u> The Joint Primary Aircraft Training System (JPATS) is a joint USAF/USN venture to replace the Services' fleets of primary trainer aircraft (T-37 and T-34, respectively) and associated Ground Based Training Systems (GBTS). The aircraft and GBTS will be used to train entry-level student aviators in the fundamentals of flying so they can transition into advanced tracks leading to qualification as military pilots, navigators, and naval flight officers. The program includes the purchase of aircraft, simulators, and other associated ground-based training devices, training integration management systems, instructional courseware, and logistics support. Funding reflects the requirements of the May 96 (Rev 1) Operational Requirements Document. In Jun 95, Raytheon (Beech) Aircraft was selected as the aircraft prime contractor. Resolution of protests and contract award occurred in Feb 96.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 27,532 Continued first aircraft development and complete aircraft Critical Design Review (CDR) - (U) 5,524 Modified contract to support GBTS development - (U) 925 Continued flight test program - (U) 7,110 Other Government costs - (U) \$41,091 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 17,441 Continue first aircraft development - (U) 26,643 Continue Ground Based Training System (GBTS) development - (U) 2,100 Continue flight test program - (U) 8,706 Other Government costs - (U) \$54,890 Total 												
Project 4102				Page 4 of 14 Pages				Exhibit R-2 (PE 0604233F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng	PROJECT 4102
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(U) FY 1999 (\$ in Thousands):

- (U) 6,543 Deliver Manufacturing Development aircraft (T-1)
- (U) 34,162 Continue GBTS development and complete GBTS CDR
- (U) 100 Complete flight test program
- (U) 3,568 Other Government costs
- (U) \$44,373 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY1998 PB)	52,796	63,388	58,267	336,400
(U) Appropriated Value	55,300	58,388		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,179	-2,126		
b. SBIR	-1,325	-1,372		
c. Omnibus or Other Above Threshold Reprogram	-11,575			
d. Below Threshold Reprogramming				
e. Rescissions	-130			
(U) Adjustments to Budget Years Since FY1998 PB			-13,894	.
(U) Current Budget Submit/1999 President's Budget	41,091	54,890	44,373	268,693

(U) Change Summary Explanation:

Funding: FY97 and FY98 include Congressional/general reductions, SBIR, reprogrammings, and rescissions. JPATS adjustments in FY99 are based on Ground Based Training System (GBTS) contractor cost proposals that were lower than anticipated and to Air Force funding availability. JPATS "to complete" funding decreases due to a shift of mission support costs from RDT&E to Aircraft Procurement. FY99 and "to complete" reflect inflation rate changes.

Schedule: JPATS first flight slipped from Mar to May 98 due to manufacturing process delays. Air Force acceptance (DD 250) of JPATS aircraft T-1 may slip five months. As a result of FY99 funding reductions, JPATS Training Integration Management System (TIMS) is impacted, which may cause Air Force Milestone III to slip to 2QFY00.

Technical: N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng	PROJECT 4102
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(U) **C. Other Program Funding Summary (\$ in Thousands)**

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	To Compl	Total Cost
(U) <u>Aircraft Procurement, Air Force, BA-3</u>									
JPATS	66,866	75,878	107,086	85,500	100,561	217,437	255,035	663,500	1,670,063
JPATS, BA-6							62,511	59,607	122,118
(U) <u>Military Construction, Air Force</u>									
PE 0804741F, JPATS	0	2,470	0	3,200	0	0	3,200	7,700	16,570
(U) <u>RDT&E, Navy, BA-7</u>									
PE 0603208N, Training System Aircraft, H1150, JPATS	1,834	391	595	316	0	0	0	0	11,531
(U) <u>Aircraft Procurement, Navy, BA-3</u>									
JPATS	0	0	0	33,294	80,104	81,452	83,359	1,373,700	1,651,909
APN 6 Spares	0	0	0	0	0	0	21,642	128,100	149,742
(U) <u>Military Construction, Navy</u>	0	0	0	9,300	1,500	600	1,300	11,617	24,317

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng	PROJECT 4102
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	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) D. <u>Schedule Profile</u>												
(U) Aircraft CDR	*											
(U) GBTS Source Selection Decision			*									
(U) GBTS Contract Mod				*								
(U) Aircraft T-1 First Flight							X					
(U) Begin Phase II QT&E							X					
(U) Delivery of Aircraft T-1									X			
(U) Delivery of Aircraft P-1									X			
(U) GBTS CDR										X		
(U) Multi-Service OT&E Complete												X
(U) Milestone III												
2QFY00												
(U) IOC Air Force												
4QFY01												
(U) IOC Navy												
4QFY03												
* Denotes completed milestone												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng				PROJECT 4102	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Aircraft Missionization/Test and Evaluation				28,457	19,541	6,643			
(U)	Ground Based Training System (GBTS)				5,524	26,643	34,162			
(U)	Other Government Costs (OGC)				7,110	8,706	3,568			
(U)	Total				41,091	54,890	44,373			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Raytheon Aircraft Company (RAC)	C/FPIF	5 Feb 96	162,300	175,500	54,723	28,457	19,541	6,643	495	109,859*
Flight Safety Services Corp.	N/A**	26 Sep 97	N/A***	N/A***	400	5,524	26,643	34,162	52,587	119,316*
<u>Support and Management Organizations</u>										
Various	Various	Various	N/A	N/A	12,746	7,110	8,706	3,568	7,388	39,518
<u>Test and Evaluation Organizations:</u> Not Applicable										
* RAC contract Total Program includes contract "to ceiling", Engineering Change Order (ECO), and Award Fee										
** Subcontract to RAC										
*** RAC EAC includes subcontracted GBTS effort and is not individually reported.										
Project 4102					Page 8 of 14 Pages			Exhibit R-3 (PE 0604233F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng	PROJECT 4102
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: None

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				55,123	33,981	46,184	40,805	53,082	229,175
Subtotal Support and Management				12,746	7,110	8,706	3,568	7,388	39,518
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				67,869	41,091	54,890	44,373	60,470	268,693

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng				PROJECT 4376	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4376 T-38 Avionics Upgrade program (AUP)	22,884	12,976	11,190	1,541	0	0	0	0	63,540
Quantity of RDT&E Articles	2/\$12,700	0	0	0	0	0	0	0	2/\$12,700

(U) A. Mission Description and Budget Item Justification

The T-38 Avionics Upgrade Program (AUP) is an integrated modernization of the T-38 and AT-38 cockpits to support mission-ready bomber and fighter training. The modernized digital cockpit will include Global Positioning System (GPS), Head-Up Display (HUD), Inertial Navigation System (INS), Multi-Function Displays (MFDs), Data Transfer System (DTS), No-Drop Bombing System (NDBS), and Hands-On Throttle and Stick (HOTAS) switchology. HUD symbology will be the new USAF standard recently certified as a primary flight reference. Also included is the acquisition of two types of Aircrew Training Devices (ATDs) to replace the existing T-51 simulators. The program includes the design, integration, test, and installation of the cockpit prototype in aircraft, ATDs, and other training devices.

(U) FY 1997 (\$ in Thousands):

- (U) 22,884 Continue EMD phase - conduct System Requirement Review; complete demonstrations and studies; develop software; software and system integration and contractor testing; conduct System/Software Design Reviews; complete air vehicle Initial and Final Design Reviews
- (U) \$22,884 Total

(U) FY 1998 (\$ in Thousands):

- (U) 12,976 Continue EMD phase; complete modification of EMD aircraft numbers one and two; complete contractor testing; complete integration first flight; conduct DT&E/IOT&E; perform production planning; perform manufacturing lineproofing; conduct ATD design reviews; start ATD CLS and Training Software Support Center (TSSC) site assessments; start ATD testing
- (U) \$12,976 Total

(U) FY 1999 (\$ in Thousands):

- (U) 11,190 Complete government flight test; conduct Functional Configuration Audit (FCA); conduct Production Readiness Review (PRR); obtain production Milestone III approval; continue Aircrew Training Device (ATD) Contractor Logistics Support (CLS) and Avionics Support (AVS) Contractor Owned and Maintained Base Supply (COMBS) planning; build ATD prototypes and continue ATD testing; complete Training Software Support Center (TSSC) delivery
- (U) \$11,190 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng				PROJECT 4376		
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) <u>Aircraft Procurement, Air Force</u>										
PE 0804741F, T-38 Avionics Upgrade, BP 1100		0	0	38,068	95,684	92,349	87,025	105,138	168,927	587,191
(U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2
(U) System Requirements Review	*									
(U) Complete Test and Evaluation Master Plan		*								
(U) Air Vehicle Initial Design Review			*							
(U) Air Vehicle Final Design Review				*						
(U) ATD Initial Design Review					X					
(U) ATD Final Design Review						X				
(U) First Flight							X			
(U) DT&E Complete								X		
(U) IOT&E Complete								X		
(U) Functional Configuration Audit (FCA)								X		
(U) Milestone III Production Decision									X	
(U) First Production ATD Delivered (1QFY00)										
(U) First Production Aircraft Delivered (2QFY00)										
* Denotes completed milestone										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604233F Specialized Undergraduate Pilot Trng			PROJECT 4376		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Avionics System Upgrade				13,143	3,946	1,794			
(U)	Aircrew Training Devices				3,065	3,885	1,397			
(U)	System Engineering/Program Management				2,125	1,750	1,118			
(U)	System Test and Evaluation				346	600	1,178			
(U)	Training				58	80	95			
(U)	EMD Data				94	90	234			
(U)	Mission Support Equipment				147	4	0			
(U)	Maintenance Support Equipment				6	2	0			
(U)	Award Fee				900	900	1,000			
(U)	Other Government Costs				3,000	1,719	4,374			
(U)	Total				22,884	12,976	11,190			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
McDonnell	C/CPAF	31 Jul 96	47,336	48,800	12,549	18,984	9,280	5,695	1,541	48,049
Douglas										
ASC/TAA	Various	Annual	N/A	N/A	2,084	2,917	2,620	4,520	0	12,141
WPAFB OH										
Project 4376					Page 13 of 14 Pages			Exhibit R-3 (PE 0604233F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE
5 - Engineering and Manufacturing Development										February 1998
BUDGET ACTIVITY					PE NUMBER AND TITLE					PROJECT
					0604233F Specialized Undergraduate Pilot Trng					4376
<u>Support and Management Organizations</u>										
SA-ALC/LF	Various	Quarterly	N/A	N/A	225	152	80	80	0	537
Kelly AFB TX										
AETC Randolph	Various	Quarterly	N/A	N/A	1	108	80	90	0	279
AFB TX										
OO-ALC/LIR	Various	Quarterly	N/A	N/A	90	250	130	200	0	670
Ogden AFB UT										
<u>Test and Evaluation Organizations</u>										
445 FLTS	PO	Annual	N/A	N/A	0	395	608	205	0	1,208
Edwards AFB										
CA										
AFOTEC	PO	Annual	N/A	N/A	0	78	178	400	0	656
Kirtland AFB										
NM										
Government Furnished Property: None										
Subtotal Product Development					14,633	21,901	11,900	10,215	1,541	60,190
Subtotal Support and Management					316	510	290	370	0	1,486
Subtotal Test and Evaluation					0	473	786	605	0	1,864
Total Project					14,949	22,884	12,976	11,190	1,541	63,540

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604239F F-22 EMD	PROJECT 4069
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4069 Advanced Tactical Fighter - FSD	1,888,985	1,958,915	1,582,217	1,204,490	995,191	811,092	221,494	0	22,663,988
Quantity of RDT&E Articles	1	1	1	3	3	0	0	0	9*

***Unit cost of RDT&E articles not separately priced.**

Note: - FY97 funding that was in PE27219F for Out of Production Parts (OPP) was moved to PE 64239F Project 4772 for FY97 only;

Funding for OPP in FY98-FY01 is in Project 4069.

- Total Cost includes \$3,779,811,000 of Demonstration and Validation funding prior to FY92 funded in PE 0603230F

(U) A. Mission Description and Budget Item Justification

The F-22 is designed to penetrate enemy airspace and achieve a first look, first kill capability against multiple targets. The F-22 is characterized by a low observable, highly maneuverable airframe, advanced integrated avionics, and aerodynamic performance that allows supersonic cruise without the use of afterburner. The F-22 is currently in the Engineering and Manufacturing Development (EMD) phase of acquisition and plans to release long lead production funding for Lot 1 aircraft in FY98.

The EMD phase effort consists of:

- Design, development, fabrication, test and delivery of nine flight test vehicles and two ground test vehicles (static and fatigue).
- Design, development, fabrication, and delivery of 26 flight qualified engines.
- Design, development, fabrication, integration, and test of the EMD avionics suite including air-to-surface provision.
- Updating the YF-22 Avionics Flying Laboratory with EMD assets and software to become a Flying Test Bed (FTB) to support avionics integration.
- Design, development, and test of F-22 weapons system support and training system.

This program is in Budget Activity 5, Engineering and Manufacturing Development, because the F-22 Program is developing the next-generation air superiority fighter for the USAF to counter emerging worldwide threats.

(U) Acquisition Strategy: The EMD contract is Cost Plus Award Fee with Lockheed Martin Aeronautical Systems (LMAS) and Pratt & Whitney (P&W) to produce the F119 engines. The engines are provided to LMAS as Government Furnished Equipment (GFE).

Note:

The F-22 EMD program is currently Congressionally capped at \$18,688M. Efforts are underway to adjust the cap upward by \$352.6M for OPP redesign efforts bringing the adjusted cap to \$19,040.6.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604239F F-22 EMD	PROJECT 4069
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$964,348 Air Vehicle <ul style="list-style-type: none"> - Completed assembly of Engineering and Manufacturing Development (EMD) aircraft #1. (NSP) - Continued assembly of EMD aircraft #2. (NSP) - Initiated assembly of EMD aircraft #3. (NSP) - Conducted Interim Production Readiness Review (PRR). (NSP) - Conducted First Flight Readiness Review (FRR). (NSP) - Conducted F-22 first flight. (NSP) - Began installation systems on Flying Test Bed (FTB) (NSP) - Initiated structural modification of Flying Test Bed (FTB). (NSP) - Initiated assembly of static article. (NSP) - Initiated assembly of fatigue article. (NSP) - Tech order data for First Development Test & Evaluation (DT&E) aircraft available. (NSP) - Integrated Maintenance Information System (IMIS) for flight test available. (NSP) - Supply Support Provisioning Management System implemented. (NSP) - Completed initial supportability assessment. (NSP) - Continued full scale pole model testing (RCS) (NSP) - (U) \$628,281 Avionics <ul style="list-style-type: none"> - Completed mission software Block 1 Computer Software Component (CSC) integration. (NSP) - Continued Avionics Integration Laboratory (AIL) integration in preparation of Block 1 integration testing. (NSP) - Initiated FTB modifications, fabrication, and installation, conducted air worthiness review. (NSP) - Continued mission software Block 2 coding and unit test. (NSP) - Initiated Diminishing Manufacturing Sources (DMS) redesign activities for production incorporation. (NSP) - (U) \$211,356 Engine <ul style="list-style-type: none"> -Completed initial flight test engine qualification testing. (NSP) -Delivered and support five flight test engines. (NSP) -Began verification of engine support system products. (NSP) -Continued engine development test program and initiate production engine configuration testing. (NSP) -Added one ground test engine (8 total) (NSP) -Continued to build and test additional flight test engines (NSP) 		
Project 4069	Page 2 of 10 Pages	Exhibit R-2 (PE 0604239F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604239F F-22 EMD	4069
<ul style="list-style-type: none"> - (U) \$85,000 Other Government Cost <ul style="list-style-type: none"> - Flight test support at Edwards AFB. - Continued support of engine testing. - Continued sled test program at Holloman AFB. - Further phase II aperture measurements at Rome Labs. - Additional stores separation wind tunnel testing at AEDC. - Mission support of the SPO; travel, computer costs, training, communications, misc contracts, etc. - Procurement of required government furnished equipment (GFE). - Avionics ground testing at various government test facilities - Continued live fire testing at Wright Labs - (U) \$1,888,985 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,165,046 Air Vehicle <ul style="list-style-type: none"> - Complete assembly of Engineering and Manufacturing Development (EMD) aircraft #2. (NSP) - Continue assembly of EMD aircraft #3. (NSP) - Initiate assembly of EMD aircraft # 4-6. (NSP) - Continue systems installations on Flying Test Bed (FTB) (NSP) - Continue full scale pole model testing (RCS) (NSP) - Continue flight test and flight test support (NSP) - (U) \$452,160 Avionics <ul style="list-style-type: none"> - Begin Avionics Integration Laboratory (AIL) Block 1 integration (NSP) - Continue incorporating Avionics hardware into the FTB (NSP) - Begin AIL integration in preparation of Block 2 integration testing (NSP) - Begin delivery and installation of avionics hardware on the first avionics test aircraft (NSP) - Continue DMS redesign activities for production incorporation (NSP) - Initiate FTB flight testing. (NSP) - (U) \$208,909 Engine <ul style="list-style-type: none"> - Continue production engine configuration development testing (NSP) - Continue to deliver and support three additional flight test engines (8 total) (NSP) - Continue verification of engine support system products (NSP) - Continue to build and test additional flight test engines (NSP) 		
Project 4069	Page 3 of 10 Pages	Exhibit R-2 (PE 0604239F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604239F F-22 EMD	
		PROJECT 4069
- (U) \$132,800	Other Government Cost - Flight test and flight test support at Edwards AFB - Continued support of engine testing - Continue stores separation testing at AEDC - Continue sled test program at Holloman AFB - Continue aperture measurements at Rome Labs - Avionics ground testing at various government test facilities - Mission support of the SPO; travel, computer costs, misc contracts, etc. - Procurement of required government furnished equipment (GFE) - Continue Live Fire testing at Wright Labs	
- (U) \$1,958,915	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
- (U) \$826,696	Air Vehicle - Complete assembly of EMD aircraft #3 . (NSP) - Continue assembly of EMD aircraft #4-6. (NSP) - Initiate assembly of EMD aircraft #7-9. (NSP) - Conduct First Flight Readiness Review (FRR) for aircraft #4. (NSP) - Begin static test. (NSP) - Begin fatigue test. (NSP) - Complete full scale pole model testing (RCS) (NSP) - Continue flight test and flight test support (NSP)	
- (U) \$461,831	Avionics - First flight of the first avionics test aircraft (NSP) - Continue flight testing avionics on the FTB (NSP) - Complete Avionics Integration Laboratory (AIL) Block 1 integration (NSP) - Begin AIL Block 3 integration (NSP) - Continue DMS redesign, requalification and retesting activities (NSP)	
- (U) \$174,490	Engine - Continue to deliver and support eleven additional flight test engines (19 total) (NSP) - Continue verification of engine support system products (NSP) - Continue building and testing flight test engines (NSP) - Initiate qualification testing of production engine configuration (NSP)	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604239F F-22 EMD	PROJECT 4069		
<ul style="list-style-type: none"> - (U) \$119,200 Other Government Cost <ul style="list-style-type: none"> - Flight test and flight test support at Edwards AFB - Continued support of engine testing at AEDC - Completion of aperture measurements at Rome Labs - Continue avionics ground testing at various government facilities - Mission support of the SPO; travel, computer costs, misc contracts, etc. - Procurement of required government furnished equipment (GFE) - Continue sled test program at Holloman AFB - Continue live fire testing at Wright Lab - Completion of stores separation testing at AEDC - (U) \$1,582,217 Total 				
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998PB)	1,818,462	2,071,234	1,464,782	22,398,214
(U) Appropriated Value	1,906,021	2,077,234		
(U) Adjustments to Appropriated Value				
a. General Congressional Reductions	-39,906	-68,250		
b. SBIR	-47,653	-50,069		
c. Omnibus & Other Above Threshold Reprogramming	73,531			
d. BTR				
e. Rescission	-3,008			
(U) Adjustments to Budget Years Since FY98 PB			117,435	
(U) Current Budget Submit/FY99 President's Budget (PB)	1,888,985	1,958,915	1,582,217	22,663,988
 (U) Change Summary Explanation:				
Funding:				
- The FY97 appropriated value was increased by \$73.531M as a result of a reprogramming from the 3010 appropriation for OPP redesign efforts.				
Project 4069		Page 5 of 10 Pages		Exhibit R-2 (PE 0604239F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604239F F-22 EMD	PROJECT 4069
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- The adjustments to budget years since the FY98 PB include transfers from aircraft procurement for out-of-production parts redesigns and operations & maintenance for lab infrastructure costs. An adjustment in inflation assumptions also was included.
- \$13.328M of FY98 funds is pending reprogramming to fund higher priorities.

Schedule: None

Technical: None

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) Military Construction (PE 0604239F)	4,390	0	0	0	0			0	**21,040
(U) Military Construction (PE 0207219F)	0	0	0	16,400	17,300	17,300	9,800	190,400	251,200
(U) Aircraft Procurement (PE 0207219F)	7,481	73,188	813,814	1,546,828	2,409,369	3,100,715	4,264,526	30,388,007	42,603,928

** Includes \$16,650 of FY96 & prior funds.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604239F F-22 EMD			PROJECT 4069		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Air Vehicle/Avionics				1,592,629	1,617,206	1,288,527				
(U) Engine				211,356	208,909	174,490				
(U) Government Cost										
- Government Test				61,600	75,300	78,500				
- Mission Support				13,700	14,500	14,000				
- HAZMAT				500	25,000	23,000				
- GFE				9,200	18,000	3,700				
(U) Total				1,888,985	1,958,915	1,582,217				
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Lockheed (Air Veh)	C/CPAF	Aug 91	12,475,239	15,206,226	8,306,104	1,592,629	1,617,206	1,288,527	2,413,678	15,218,144
Pratt & Whitney	C/CPAF	Aug 91	2,194,010	2,480,423	1,619,589	211,356	208,909	174,490	267,489	2,481,833
<u>Support and Management Organizations</u>										
Support Contracts	Various	Various	N/A	N/A	8,155	2,000	27,247	25,303	31,800	94,505
Project 4069				Page 8 of 10 Pages				Exhibit R-3 (PE 0604239F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY					PE NUMBER AND TITLE					PROJECT
5 - Engineering and Manufacturing Development					0604239F F-22 EMD					4069
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
In House Support	Various	Various	N/A	N/A	59,845	12,200	12,253	11,697	48,200	144,195
<u>Test and Evaluation Organizations</u>										
AEDC	PO		N/A	N/A	67,500	19,900	18,400	10,700	10,200	126,700
AFFTC	PO		N/A	N/A	71,500	34,900	43,300	59,500	454,800	664,000
All Other Tests	Various	Various	N/A	N/A	65,900	6,800	13,600	8,300	1,200	95,800
* Note: The Project Office EAC includes the following items not included in the Performing Activity (i.e. Contractor) EAC - Base Fee, Award Fee, SPO Planned CCPs not yet on contract, and other adjustments based on results of the restructured program.										
Government Furnished Property:										
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>		<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>										
GFE	Various	Various	Various		23,200	9,200	18,000	3,700	4,900	59,000
<u>Support and Management Property</u>										
		N/A	N/A		0	0	0	0	0	0
<u>Test and Evaluation Property</u>										
		N/A	N/A		0	0	0	0	0	0
Project 4069					Page 9 of 10 Pages			Exhibit R-3 (PE 0604239F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604239F F-22 EMD	PROJECT 4069
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<u>Item Description</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development	9,948,893	1,813,185	1,844,115	1,466,717	2,686,067	17,758,977
Subtotal Support and Management	68,000	14,200	39,500	37,000	80,000	238,700
Subtotal Test and Evaluation	204,900	61,600	75,300	78,500	466,200	886,500
Total Project	*14,001,604	1,888,985	1,958,915	1,582,217	3,232,267	*22,663,988

* Includes \$3,779,811 of Demonstration and Validation funding prior to FY 92 funded in PE 0603230F.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	585,612	335,254	131,247	202,744	73,822	25,185	13,463	0	24,758,097
3843 B-2 Advanced Technology Bomber	474,989	335,254	131,247	202,744	73,822	25,185	13,463	0	24,647,474
4609 B-2 ENHANCEMENTS	110,623	0	0	0	0	0	0	0	110,623
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	5

(U) A. Mission Description and Budget Item Justification
 The B-2 SPIRIT is America's most advanced long-range strike aircraft. This all-wing two crew member aircraft has twin weapons bays of over 20,000 pounds capacity each and employs a wide array of signature reduction technologies to greatly enhance both its ability to penetrate enemy defenses and its ability to survive in a highly defended target environment. The B-2 provides global force projection capability and the ability to influence an enemy with insensitivity to the location of enemy assets or the availability of forward basing. This program is in budget activity 5 - Engineering and Manufacturing Development, because of concurrency in developing, testing, producing, and deploying the B-2.

(U) Acquisition Strategy:
 Acquisition reform strategies are employed to achieve maximum/best value (i.e. MSIP Indefinite Delivery/Indefinite Quantity contract - limited specifications, limited contract data requirements).

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	595,496	355,750	44,894	24,696,293
(U) Appropriated Value	624,454	355,750		
(U) Adjustments to Appropriated Value				
a. Congressional Reductions	-13,186	-12,113		
b. SBIR	-15,772	-8,383		
c. Omnibus or Other Above Threshold Reprogram	-7,766			
d. Below Threshold Reprogramming	-1,134			
e. Rescissions	-984			
(U) Adjustments to Budget Years Since FY 1998 PB			86,353	
(U) Current Budget Submit FY1999 President's Budget	585,612	335,254	131,247	24,758,097

(U) Change Summary Explanation:

Funding:

FY97: Reflects \$7.8M Omnibus, \$984K recission to support Bosnia supplemental, \$1,134K reprogrammed to support higher Air Force priorities.

FY99: Restored \$89M for completion of rework of EMD air vehicles to fully operational capability, less \$2.6M for inflation adjustment.

Schedule: N/A

Technical: N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
A/C Proc, AF, Combat A/C/BA01/B-2A	85,770	323,429							17,761,640
A/C Proc, AF, Post Prod Support/BA07			189,869	111,701	31,119	16,556	7,657	30,400	387,302
A/C Proc, AF, Modifications/BA05/B-2A	9,369	13,543	15,681	21,023	13,167	15,859	9,971	16,800	220,913
A/C Proc, AF, Cmn Spt Eq/BA07/Items<\$2M	471	491	0	471	470	451	455	970	8,255
A/C Proc, AF, A/C Replen Spares/BA06/B-2A	0	0	0	0	0	0	0	0	0
A/C Proc, AF, A/C Initial Spares/BA06/B-2A	12,847	13,197	55,509	35,445	19,417	6,915	2,409	0	1,077,048
Proc (Other), AF/BA 02,03, 04/B-2A	9,712	10,586	6,115	5,904	6,250	7,789	7,835	297	91,756
Military Construction/BA01	0	27,074	0	0	0	0	0	0	74,674
A/C Proc, AF, A/C Spt Eqpt & Fac/BA07/ Bomber, Industrial Base Support	0	0	0	0	0	0	0	0	100,399
A/C Proc, AF, A/C Spt Eqpt & Fac/BA07/ Industrial Preparedness/PE708011F	1,000	0	0	0	0	0	0	0	9,400
Missile Proc, AF, Oth Missiles/BA42/ GPS Aided Munition/PE28030F	0	0	0	0	0	0	0	0	24,823
<u>Related RDT&E</u> NA									

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
MSIP PMD Directions Received	*											
JSOW/GWIS Contract Award			*									
JSOW/GWIS Functional Final Design Review					x							
JSOW/GWIS Flight Test Complete										x		
JSOW/GWIS Certification											x	
Flight Test Transition to Sustainment Operations				*								
Block 30 First Delivery				*								
Initial Operational Capability (IOC)		*										
Block-30 Nuclear Certification					*							

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber
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	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
AV-2 Block-30 Delivery (1st Mod Line Delivery)					*							
Eighth Block-30 Delivery (Completes First Squadron)									x			
Full Operational Capability (FOC)											x	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber				PROJECT 3843				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3843 B-2 Advanced Technology Bomber				474,989	335,254	131,247	202,744	73,822	25,185	13,463	0	24,647,474
<p>(U) A. <u>Mission Description and Budget Item Justification</u> The B-2 SPIRIT is America's most advanced long-range strike aircraft. This all-wing two crew member aircraft has twin weapons bays of over 20,000 pounds capacity each and employs a wide array of signature reduction technologies to greatly enhance both its ability to penetrate enemy defenses and its ability to survive in a highly defended target environment. The B-2 provides global force projection capability and the ability to influence an enemy with insensitivity to the location of enemy assets or the availability of forward basing. This program is in budget activity 5 - Engineering and Manufacturing Development, Research because of concurrency in developing, testing, producing, and deploying the B-2.</p> <p><u>(U) FY 1997 (\$ in Thousands):</u> (U) - \$108,489 Continued developmental test and evaluation (U) - \$ 58,520 Continued development and support acquisition (U) - <u>\$307,980</u> Completed primary hardware development (U) - \$474,989 Total</p> <p><u>(U) FY 1998 (\$ in Thousands):</u> (U) - \$ 15,102 Continue developmental test and evaluation (Maintain minimal flight test infrastructure) (U) - \$ 22,764 Air Force Mission Support System (AFMSS) (U) - \$ 15,165 Labs and Other Government Costs (U) - <u>\$282,223</u> EMD Aircraft rework (U) - \$335,254 Total</p> <p><u>(U) FY 1999 (\$ in Thousands):</u> (U) - \$ 12,200 Continue developmental test and evaluation (Maintain minimal flight test infrastructure) (U) - \$ 12,127 Air Force Mission Support System (AFMSS) (U) - \$ 9,412 Labs and Other Government Costs (U) - <u>\$ 97,508</u> EMD Aircraft rework (U) - \$131,247 Total</p>												
Project 3843				Page 5 of 15 Pages				Exhibit R-2 (PE 0604240F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber	PROJECT 3843
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	595,496	355,750	44,894	24,585,670
(U) Appropriated Value	508,454	355,750		
(U) Adjustments to Appropriated Value				
a. Congressional Reductions	-10,739	-12,113		
b. SBIR	-12,842	-8,383		
c. Omnibus or Other Above Threshold Reprogram	-7,766			
d. Below Threshold Reprogramming	-1,134			
e. Rescissions	-984			
(U) Adjustments to Budget Years Since FY 1998 PB			86,353	
(U) Current Budget Submit FY 1999 President's Budget	474,989	335,254	131,247	24,647,474

(U) Change Summary Explanation:

Funding:

FY97: Reflects \$7.8M Omnibus reprogramming, \$984K recession to support Bosnia supplemental, \$1,134K reprogrammed to support higher Air Force priorities.

FY99: Restored \$89M for completion of rework of EMD air vehicles to fully operational capability, less \$2.6M for inflation adjustment.

Schedule: N/A

Technical: N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber	PROJECT 3843
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
A/C Proc, AF, Combat A/C/BA01/B-2A	85,770	323,429							17,761,640
A/C Proc, AF, Post Prod Support/BA07			189,869	111,701	31,119	16,556	7,657	30,400	387,302
A/C Proc, AF, Modifications/BA05/B-2A	9,369	13,543	15,681	21,023	13,167	15,859	9,971	16,800	220,913
A/C Proc, AF, Cmn Spt Eq/BA07/Items<\$2M	471	491	0	471	470	451	455	970	8,255
A/C Proc, AF, A/C Replen Spares/BA06/B-2A	0	0	0	0	0	0		0	0
A/C Proc, AF, A/C Initial Spares/BA06/B-2A	12,847	13,197	55,509	35,445	19,417	6,915	2,409	0	1,077,048
Proc (Other), AF/BA 02,03, 04/B-2A	9,712	10,586	6,115	5,904	6,250	7,789	7,835	297	91,756
Military Construction/BA01	0	27,074	0	0	0	0		0	74,674
A/C Proc, AF, A/C Spt Eqpt & Fac/BA07/ Bomber, Industrial Base Support	0	0	0	0	0	0		0	100,399
A/C Proc, AF, A/C Spt Eqpt & Fac/BA07/ Industrial Preparedness/PE708011F	1,000	0	0	0	0	0		0	9,400
Missile Proc, AF, Oth Missiles/BA42/ GPS Aided Munition/PE28030F	0	0	0	0	0	0		0	24,823
<u>Related RDT&E</u> NA									

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
Flight Test Transition to Sustainment Operations				*								
Block 30 First Delivery				*								
Block-30 Nuclear Certification					*							
AV-2 Block-30 Delivery (1st Mod Line Delivery)					*							
Eighth Block-30 Delivery (Completes First Squadron)									x			
Full Operational Capability (FOC)											x	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber	PROJECT 3843
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Equipment Development & Evaluation	405,481	304,987	109,635
(U) Government Test	37,253	15,102	12,200
(U) Other Government Costs (OGC)	5,019	6,165	3,332
(U) Other	27,236	9,000	6,080
(U) Total	474,989	335,254	131,247

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Air Vehicle - NG	CPIF/AF	Nov 1981	20,916,627	21,251,418	20,265,843	370,936	281,730	97,358	235,551	21,251,418
Aircrew Training	CPIF	Jul 1985	561,345	561,345	561,145	200	0	0	0	561,345
Mission Planning	Multiple	Multiple	326,286	326,286	253,624	26,065	22,764	12,127	11,706	326,286
<u>Support and Management Organizations</u>										
Other Govt Costs	N/A		964,832	964,832	892,956	32,255	15165	9,412	15,044	964,832
<u>Test and Evaluation Organizations</u>										
Govt Test	N/A	N/A	849,633	849,633	732,165	37,253	15,102	12,200	52,913	849,633

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber				PROJECT 3843	
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>									
Government Furnished Property:									
Support and Management Property: None									
Test and Evaluation Property: None									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
Engines G.E.	Multiple	Multiple	N/A	563,934	4,151	150	0	0	568,235
AARL Boeing	FPIF	Jun 88	N/A	121,103	4,129	343	150	0	125,725
Subtotal Product Development				21,765,649	405,481	304,987	109,635	247,257	22,833,009
Subtotal Support and Management				892,956	32,255	15,165	9,412	15,044	964,832
Subtotal Test and Evaluation				732,165	37,253	15,102	12,200	52,913	849,633
Total Project				23,390,770	474,989	335,254	131,247	315,214	24,647,474
Project 3843				Page 9 of 15 Pages			Exhibit R-3 (PE 0604240F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber				PROJECT 4609	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4609 B-2 ENHANCEMENTS	110,623	0	0	0	0	0	0	0	110,623
<p>(U) A. <u>Mission Description and Budget Item Justification</u> B-2 enhancements will be accomplished via a Multi Staged Improvement Program (MSIP) that will plan, study, design, integrate, test, produce and support the implementation of Air Combat Command's future B-2 weapon system requirements defined in the Bomber Configuration Plan. Post Block-30 improvements pursued in this program includes projects to enhance lethality, survivability, reliability, maintainability, etc.. This program is a budget activity 5 - Engineering Manufacturing Development, because of the concurrency in developing, testing, producing, and deploying the B-2.</p> <p>ACQUISITION STRATEGY: Acquisition reform strategies are employed to achieve maximum/best value (i.e. MSIP Indefinite Delivery/Indefinite Quantity contract - limited specifications, limited contract data requirements).</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 10,600 Development test and evaluation. - (U) \$ 25,993 Development and support acquisition. - (U) \$ 74,030 Primary hardware development. - (U) \$110,623 Total 									
Project 4609			<i>Page 10 of 15 Pages</i>			Exhibit R-2 (PE 0604240F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber	PROJECT 4609
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY9 1998 PB)	0	0	0	0
(U) Appropriated Value	116,000	0	0	116,000
(U) Adjustments to Appropriated Value				
a. Congressional Reductions	-2,447			
b. SBIR	-2,930			
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) Current Budget Submit FY1999 President's Budget	110,623	0	0	110,623

(U) Change Summary Explanation:

Funding:

FY 97: Congress added \$116M to accelerate post Block-30 capabilities.

Schedule: N/A.

Technical: N/A.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber	PROJECT 4609
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
A/C Proc, AF, Combat A/C/BA01/B-2A	85,770	323,429							17,761,640
A/C Proc, AF, Post Prod Support/BA07			189,869	111,701	31,119	16,556	7,657	30,400	387,302
A/C Proc, AF, Modifications/BA05/B-2A	9,369	13,543	15,681	21,023	13,167	15,859	9,971	16,800	220,913
A/C Proc, AF, Cmn Spt Eq/BA07/Items<\$2M	471	491	0	471	470	451	455	970	8,255
A/C Proc, AF, A/C Replen Spares/BA06/B-2A	0	0	0	0	0	0		0	0
A/C Proc, AF, A/C Initial Spares/BA06/B-2A	12,847	13,197	55,509	35,445	19,417	6,915	2,409	0	1,077,048
Proc (Other), AF/BA 02,03, 04/B-2A	9,712	10,586	6,115	5,904	6,250	7,789	7,835	297	91,756
Military Construction/BA01	0	27,074	0	0	0	0		0	74,674
A/C Proc, AF, A/C Spt Eqpt & Fac/BA07/ Bomber, Industrial Base Support	0	0	0	0	0	0		0	100,399
A/C Proc, AF, A/C Spt Eqpt & Fac/BA07/ Industrial Preparedness/PE708011F	1,000	0	0	0	0	0		0	9,400
Missile Proc, AF, Oth Missiles/BA42/ GPS Aided Munition/PE28030F	0	0	0	0	0	0		0	24,823
<u>Related RDT&E</u> NA									

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
MSIP PMD Direction Received	1											
JSOW/GWIS Contract Award	*											
JSOW/GWIS Functional Final Design												
Reveiw						x						
JSOW/GWIS Flt Test Complete										x		
JSOW/GWIS Certification											x	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber	PROJECT 4609
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Equipment Development & Evaluation	91,530	0	0
(U) Government Test	10,600	0	0
(U) Other Government Costs	8,493	0	0
(U) Total	110,623	0	0

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber				PROJECT 4609	
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performin g Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Northrop-Grumman	TBD	May 97	67,715	74,030	0	74,030	0	0	0	74,030
Mission Planning	TBD	Various	17,500	17,500	0	17,500	0	0	0	17,500
<u>Support and Management Organizations</u>										
OGC	N/A	N/A	8,493	8,493	0	8,493	0	0	0	8,493
<u>Test and Evaluation Organizations</u>										
Govt Test	N/A	N/A	10,600	10,600	0	10,600	0	0	0	10,600
Project 4609										
Page 14 of 15 Pages										
Exhibit R-3 (PE 0604240F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604240F B2 Advanced Technology Bomber	PROJECT 4609
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Government Furnished Property: N/A

	<u>Total</u>	<u>Prior to</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget</u>	<u>Budget to</u>	<u>Total</u>
Subtotal Product Development	0	91,530	0	0	0	0	91,530
Subtotal Support and Management	0	8,493	0	0	0	0	8,493
Subtotal Test and Evaluation	0	10,600	0	0	0	0	10,600
Total Project	0	110,623	0	0	0	0	110,623

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	4,132	4,112	0	0	0	0	0	0	56,104
3818 Maintenance Skills Tutor (MST)	3,212	3,752	0	0	0	0	0	0	22,288
4369 Air Education & Training Management System (AETMS)*	920	360	0	0	0	0	0	0	33,816*
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* Prior to FY96, funding for BPAC 4369 was included in PE 64227F, Flight Simulator Development, Project 3135, Advanced Training System.

(U) A. Mission Description and Budget Item Justification

This program develops manpower, personnel, and training (MPT) technologies to improve effectiveness of Air Force training, performance, assessment, personnel acquisition, job assignment, force management, and human performance in weapon systems. Program performs foundation studies, analyses, and risk-reduction activities to support MPT requirements for the combat air forces, other Air Force agencies, and the total force. MSTs are designed to leverage senior maintenance personnel experience, through the use of artificial intelligence, for use in training junior specialists. AETMS will be the major Air Education and Training Command (AETC) training system with emphasis on centralized training for a decentralized training environment. AETC will benefit from more standardized training command-wide. This program is in Budget Activity 5 as it provides for the development and engineering of education, training, and tutorial systems.

(U) Acquisition Strategy:

3818, MST - Full and open competition, inclusive of small disadvantaged firms, Cost Plus Award Fee (CPAF), Indefinite Delivery Indefinite Quantity (IDIQ) contract. Individual delivery orders will be negotiated and awarded for each tutor development, Cognitive Task Analysis (CTA), or other parts of the statement of work.

4369, AETMS - Engineering Change Proposals (ECPs) to be incorporated by modifying current Firm Fixed Price (FFP) contract with Lockheed Martin. Delivery Order on existing General Services Administration contract for analytical and engineering support and service for market survey/trade study and prototype development for the education module.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	4,689	4,534	4,230	continuing
(U) Appropriated Value	4,940	4,534		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-144	-338		
b. SBIR	-106	-84		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-550			
e. Rescissions	-8			
(U) Adjustments to Budget Years Since FY1998 PB			-4,230	
(U) Current Budget Submit/1999 President's Budget	4,132	4,112	0	56,104*
* Prior to FY96, funding for BPAC 4369 was included in PE 64227F, Flight Simulator Development, Project 3135, Advanced Training System.				
(U) Change Summary Explanation:				
Funding: FY97 and FY98 include Congressional/general reductions, SBIR, reprogrammings, and rescissions. Program terminates in FY99 due to a lack of specific user requirements.				
Schedule: Not Applicable				
Technical: Not Applicable				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> Not Applicable				
(U) D. <u>Schedule Profile</u>				
See individual project R-2 Exhibits for schedule profiles				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development				PROJECT 3818	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3818 Maintenance Skills Tutor (MST)	3,212	3,752	0	0	0	0	0	0	22,288
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The MST program fields multiple computer-based tutors, intelligent tutoring systems, and training delivery systems for the Combat Air Forces, other Air Force agencies, and the Guard/Reserves to improve training of complex skills for a broad range of Air Force jobs--primarily aircraft maintenance troubleshooting. The program also conducts foundation studies, analyses, and risk-reduction activities to support training requirements. These MSTs may include some initial skills training, but primary emphasis is on the more difficult cognitive skills such as understanding and troubleshooting problems that the maintenance-aiding equipment and systems are unable to diagnose. Initial tutors will be fieldable test/research assets developed by Armstrong Lab under the Basic Job Skills (BJS) program. The System Program Office (SPO) is developing two tutors as a pre-EMD cost and schedule risk reduction effort. The Air Force will reuse the core tutor software models from this effort for the remaining tutors.

(U) FY 1997 (\$ in Thousands):

- (U) 1,036 Completed development, begin operational evaluation and fielding of the F-16 flightline Avionics A Shop Tutor
- (U) 2,091 Continued development of the F-16 flightline Avionics B Shop Tutor
- (U) 85 Continued evaluation of tutor authoring software
- (U) \$3,212 Total

(U) FY 1998 (\$ in Thousands):

- (U) 3,046 Complete development, operational evaluation, and fielding of the F-16 flightline Avionics A Shop tutor
- (U) 706 Contract administration
- (U) \$3,752 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development			PROJECT 3818
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	3,769	4,139	4,230	continuing
(U) Appropriated Value	3,979	4,139		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-124	-303		
b. SBIR	-85	-84		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-550			
e. Rescissions	-8			
(U) Adjustments to Budget Years Since FY1998 PB			-4,230	
(U) Current Budget Submit/1999 President's Budget	3,212	3,752	0	22,288
 (U) Change Summary Explanation:				
Funding: FY97 and FY98 include Congressional/general reductions, SBIR, reprogrammings, and rescissions. Program terminates in FY99 due to a lack of defined user requirements.				
Schedule: Not Applicable				
Technical: Not Applicable				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> : Not applicable				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development	PROJECT 3818
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(U) <u>D. Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) F-16 C Shop Tutor	*											
(U) F-16 C Shop OPS EVAL & Interim Contractor Support (ICS)		X			*							
(U) F-16 A Shop Tutor			X			*						
(U) F-16 A OPS EVAL & ICS					X				*			
(U) F-15 C Shop OPS EVAL & ICS (LAB DEV)					*							
(U) F-15 A Shop OPS EVAL & ICS (LAB DEV)									*			
X Denotes milestone start												
* Denotes milestone completion												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development			PROJECT 3818		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Software Development				1,495	2,182	0			
(U)	Interim Contractor Support (ICS) software maintenance				147	160	0			
(U)	Contractor Engineering Support Total				493	580	0			
(U)	Cognitive Task Analysis Support				736	400	0			
(U)	Govt Logistics Mgt Support				213	290	0			
(U)	Govt Audio/Visual support				0	0	0			
(U)	Travel				78	98	0			
(U)	Misc/Mission Support				50	42	0			
(U)	Total				3,212	3,752	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Bolt, Beranek, & Newman (BBN)	SS/CPFF & CPAF	Feb 94	4,379	4,379	4,207	172	0	0	0	4,379
Univ. Pittsburgh	SS/CP	Feb 93	1,481	1,481	1,481	0	0	0	0	1,481
Galaxy Scientific	SS/CPFF	Jan 94	761	761	761	0	0	0	0	761
Booz Allen & Hamilton	C/CPFF	Feb 97	N/A	3,319	0	1,250	2,069	0	0	3,319
<u>Support and Management Organizations</u>										
Various	N/A	N/A	N/A	N/A	6,599	1,483	783	0	0	8,865
Project 3818					Page 6 of 12 Pages			Exhibit R-3 (PE 0604243F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development				PROJECT 3818	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Test and Evaluation Organizations:</u> None										
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date		Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Government Furnished Property:										
<u>Product Development Property</u> Cognitive Task Analysis (CTA) data provided by the SPO to the software development contractors. The data describes the systems/subsystems/components and the faults/problems to be simulated. CTA data collection and analysis performed by the SPO Scientific and Engineering Technical Assistance (SETA) contractor (Operational Technologies (OPTECH)).										
	C/CPFF	Feb 94	Various		2,276	307	900	0	0	3,483
<u>Support and Management Property:</u> Not Applicable										
<u>Test and Evaluation Property:</u> Not Applicable										
Subtotal Product Development					8,725	1,729	2,969	0	0	13,423
Subtotal Support and Management					6,599	1,483	783	0	0	8,865
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					15,324	3,212	3,752	0	0	22,288
Project 3818					Page 7 of 12 Pages			Exhibit R-3 (PE 0604243F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development	PROJECT 4369
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4369 Air Education & Training Management System (AETMS)*	920	360	0	0	0	0	0	0	33,816*
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* This project was generated by transfer of the Advanced Training System (ATS) project from PE 64227F, Training Systems Development, beginning in FY96.

(U) A. Mission Description and Budget Item Justification

AETMS expands ATS to support technical training and professional education at all AETC training activities. In this way, it provides a single command-wide education/training development, delivery, and management system. Program performs foundation studies, analyses, and risk-reduction activities to support training and professional education requirements. The program uses commercial hardware and software to yield a reliable and more maintainable system. AETMS builds upon the existing ATS and/or other commercial/newly-developed software, thus simplifying development.

(U) FY 1997 (\$ in Thousands):

- (U) 77 Residual tasks associated with the program management responsibility transfer of ATS to AETC
- (U) 843 Initiated software development studies to incorporate AETMS (professional education) functionality
- (U) \$920 Total

(U) FY 1998 (\$ in Thousands):

- (U) 360 Complete software development studies to incorporate AETMS (professional education) functionality
- (U) \$360 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development	PROJECT 4369
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	920	395	0	2,325*
(U) Appropriated Value	961	395		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-20	-35		
b. SBIR	-21			
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY1998 PB				
(U) Current Budget Submit/1999 President's Budget	920	360	0	33,816**

* The FY98 PB showed \$2,325K as the total cost. The FY98 PB did not include prior year funding from PE 64227F, Project 3135.

** Prior to FY96, funding for this BPAC was included in PE 64227F, Flight Simulator Development, Project 3135, Advanced Training System.

(U) Change Summary Explanation:

Funding: FY97 and FY98 include Congressional/general reductions and SBIR. Program will complete in FY98.

Schedule: Not Applicable

Technical: Not Applicable

(U) C. Other Program Funding Summary (\$ in Thousands): Not Applicable

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development	PROJECT 4369
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Development/Studies for AETMS (Professional Education)				X		*						
(U) Develop/Install prototype of AETMS Education Management System (EMS) at a professional education site					X			*				

X Denotes milestone start
* Denotes milestone completion

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development				PROJECT 4369	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Software Development/Studies				573	165	0			
(U)	TEAMS				125	55	0			
(U)	Travel				30	29	0			
(U)	Training Development				0	0	0			
(U)	Contract Administration				192	30	0			
(U)	AETMS/Mission Support				0	81	0			
(U)	Total				920	360	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Lockheed Martin	C, CPAF/FPI	May 89	31,675	31,675	31,675*	0	0	0	0	31,675*
Anteon Corp	Time&Mat'l	Jun 97		287	0	287	0	0	0	287
TBD	TBD	TBD		671	0	286	246	0	0	532
<u>Support and Management Organizations</u>										
Human System Center				N/A	379	347	114	0	0	840
<u>Test and Evaluation Organizations:</u> Not Applicable										
* Actual funding, prior to FY96, was included in PE 64227F, Flight Simulator Development, Project 3135, Advanced Training System.										
Project 4369					Page 11 of 12 Pages			Exhibit R-3 (PE 0604243F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604243F Mnpwr Pers & Trng Development	PROJECT 4369
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property:

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
Dev Test III/IV HW & SW	PR			482*	0	0	0	0	482*
<u>Support and Management Property:</u> Not Applicable									
<u>Test and Evaluation Property:</u> Not Applicable									
Subtotal Product Development				32,157*	573	246	0	0	32,976*
Subtotal Support and Management				379	347	114	0	0	840
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				32,536*	920	360	0	0	33,816*

* Actual funding prior to FY96 was included in PE 64227F, Flight Simulator Development, Project 3135, Advanced Training System

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	93,797	75,700	90,126	75,992	53,971	54,543	45,888	Continuing	TBD
1011 Joint Service Electronic Combat Systems Tester (JSECST)	10,304	8,918	9,801	2,994	3,047	0	0	0	46,829
2462 Compass Call (CC)	1,682	1,213	782	762	843	2,629	2,662	Continuing	TBD
3891 Advanced IR Countermeasures (AIRCМ) (Includes CMWS and ASTE)	39,725	34,852	37,335	40,545	21,472	15,595	11,564	0	300,786
3945 RF Towed Decoy Systems	42,086	30,717	42,208	31,691	28,609	36,319	31,662	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* AIRCM includes four subprojects: Common Missile Warning System (CMWS), Advanced Strategic and Tactical Infrared Expendables (ASTE), Large Aircraft IRCM (LAIRCМ), and software upgrade to AAR-47.

** Refer to individual projects for breakouts of RDT&E articles.

(U) A. Mission Description and Budget Item Justification

This program element (PE) consolidates engineering development efforts related to Air Force Electronic Warfare (EW) requirements. It centralizes USAF funding and management of common EW systems development. The use of these funds transition EW technologies to a installed operational capability. This PE executes projects IAW the DoD EW Master Plan to provide current capabilities to deter, detect, deceive and counter enemy acquisition and tracking of DoD operational platforms plus enemy Radio Frequency (RF) information operations worldwide. These projects include Infrared (IR) and RF situational awareness and self protection systems, command and control warfare (C2W) electronic attack systems, and test equipment to support these. The vast majority of projects contained herein are joint in nature and will lead to common systems responses to common threats. A key criterion for included projects is the need for developmental activities, therefore these programs are in Budget Activity 5 - Engineering and Manufacturing and Development.

Acquisition Strategy: See individual projects.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		PE NUMBER AND TITLE 0604270F EW Development		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	97,458	78,465	87,889	TBD
(U) Appropriated Value	101,923	80,465		
(U) Adjustments to Appropriated Value				
a. General Congressional Reduction	-2,156	-2,935		
b. SBIR	-2,309	-1,830		
c. Omnibus/other Above Threshold Reprogramming	-3,500			
d. Below Threshold Reprogramming				
e. Rescissions	-161			
(U) Adjustments to Budget Years Since FY 1998 PB			2,237	
(U) Current Budget Submit/1999 President's Budget	93,797	75,700	90,126	TBD
(U) Change Summary Explanation:				
Funding: FY99 Test Program Set (TPS) were rephased between FY99 and FY00 due to acquisition strategy change. \$3,500K approved by Congress as an FY97 Omnibus Source.				
Schedule: See Project Summaries.				
Technical: See Project Summaries.				
(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> See Project Summaries.				
(U) D. <u>Schedule Profile:</u> See Project Summaries.				
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604270F EW Development				PROJECT 1011		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
1011 Joint Service Electronic Combat Systems Tester (JSECST)	10,304	8,918	9,801	2,994	3,047	0	0	0	46,829	
Quantity of RDT&E Articles	0	5 / 1,250	0	0	0	0	0	0	0	
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) The JSECST will fill both an Air Force and Navy operational requirement for a small, adaptable, and highly mobile tester capable of verifying the system level performance of installed electronic countermeasures systems. Present maintenance concepts rely on the built-in-test (BIT) capabilities of the line replaceable units (LRUs) to verify system performance. This method fails to detect failures in LRU interfaces and installed aircraft (Group A) hardware. Particular emphasis will be placed on size and weight since the test set must deploy with the operational unit.</p> <p>(U) <u>Acquisition Strategy:</u> The acquisition strategy is competitive, cost-plus contracts.</p>										
Project 1011			Page 3 of 37 Pages			Exhibit R-2 (PE 0604270F)				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 1011
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(U) A. Mission Description and Budget Item Justification: - (Continued)

(U) FY 1997 (\$ in Thousands)

- (U) \$7,858 Continue Core Test Set Development
- (U) \$ 582 SPO Support
- (U) \$ 125 Government Test
- (U) \$1,739 Test Program Set (TPS) Lab Support
- (U) \$10,304 Total

(U) FY 1998 (\$ in Thousands)

- (U) \$7,150 Continue Core Test Set Development
- (U) \$ 740 SPO Support
- (U) \$ 822 TPS Lab Support
- (U) \$ 206 Government Test
- (U) \$8,918 Total

(U) FY 1999 (\$ in Thousands)

- (U) \$7,781 Complete Core Test Set Development
- (U) \$ 650 SPO Support
- (U) \$ 750 TPS Lab Support
- (U) \$ 620 Government Test
- (U) \$9,801 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 1011
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	10,638	9,490	5,944	*37,837
(U) Appropriated Value	11,163			
(U) Adjustments to Appropriated Value				
a. General Congressional Reduction	-233	-356		
b. SBIR	-292	-216		
c. Omnibus/other Above Threshold Reprogramming	-334			
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			3,857	
(U) Current Budget Submit/1999 President's Budget	10,304	8,918	9,801	*46,829

* Total includes prior year funds.

(U) Change Summary Explanation:

Funding: JSECST restructure resulted in an increase in FY99 and rephase of the follow-on Test Program (TSP) to FY00 and FY01. \$334K approved by Congress as an FY97 Omnibus source.

Schedule: JSECST restructured resulting in an 6 to 12 month slip in many development activities.

Technical: None.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 1011
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(U) C. Other Program Funding Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Aircraft Procurement, AF PE 27442F (Common ECM Equipment)									
(U) In Service Direct Ground Support Equipment, BP-12				7,809	18,930	34,965		0	61,704

Related Activities: None

(U) D. Schedule Profile:

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Preliminary Design Review	*											
(U) Critical Design Review					X							
(U) Test Readiness Review									X			
(U) Developmental Test & Evaluation										X		
(U) Functional Configuration Audit											X	
(U) Initial Operational T&E (1Q-00)												
(U) Milestone III (3Q-00)												
(U) Production Lots award (4Q-00)												

* Denotes completed activity

X Denotes planned activity

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604270F EW Development			PROJECT 1011		
(U) A. <u>Project Cost Breakdown (\$ in Thousands):</u>										
					FY 1997	FY 1998	FY 1999			
(U) EMD Contract					7,858	7,150	7,781			
(U) SPO Support					582	740	650			
(U) Government Test					125	206	620			
(U) TPS Lab Support					1,739	822	750			
(U) Total					10,304	8,918	9,801			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands):</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
AAI	CPAF	Mar 96	28,271	28,271	5,482	7,858	7,150	7,781	0	28,271
Follow on TPS Contractor	TBD	Jun 00		5,641					5,641	5,641
<u>Support and Management Organizations</u>										
ASC/LNA, NAVAIR, Wright Labs		Various			5,820	2,321	1,562	1,400	400	11,503
<u>Test and Evaluation Organizations</u>										
AFDTC, Eglin AFB FL					463	125	206	620	0	1,414
Project 1011										
Page 7 of 37 Pages										
Exhibit R-3 (PE 0604270F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 1011
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands): (Continued)

Government Furnished Property: None

<u>Item Description</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development	5,482	7,858	7,150	7,781	5,641	33,912
Subtotal Support and Management	5,820	2,321	1,562	1,400	400	11,503
Subtotal Test and Evaluation	463	125	206	620	0	1,414
Total Project	11,765	10,304	8,918	9,801	6,041	46,829

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)								DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604270F EW Development				PROJECT 2462	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2462 Compass Call (CC)	1,682	1,213	782	762	843	2,629	2,662	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	TBD	TBD
<p>(U) A. <u>Mission Description and Budget Item Justification:</u></p> <p>(U) COMPASS CALL (CC) is a fleet of EC-130H aircraft developed for command and control warfare (C2W) as stand-off platforms to disrupt enemy information operations worldwide. It is optimally employed as part of an integrated electronic attack (EA) package as it complements both present and future aerospace, ground, and sea based systems, both deployed and CONUS-based, to provide theater commanders with an integrated and comprehensive, flexible, offensive information warfare capability. This project provides a continuing technology program to keep the EC-130H current with the rapidly evolving threat.</p> <p>(U) Ongoing development programs are:</p> <ul style="list-style-type: none"> (U) HBE (High Band Exciter) - Develops extended frequency coverage for High-Band Subsystem (HBS). Contractor: Raytheon (formerly Hughes), Ft Wayne, IN. (U) TRACS (Tactical Radio Acquisition and Countermeasures Subsystem) - Develops next-generation digital receive and countermeasures subsystem. Contractor: Lockheed Martin/Sanders, Nashua NH. <p>(U) <u>Acquisition Strategy:</u> The acquisition strategy is competitive, cost-plus contract.</p>									
Project 2462			Page 9 of 37 Pages			Exhibit R-2 (PE 0604270F)			

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 2462
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(U) A. Mission Description and Budget Item Justification: - (Continued)

(U) FY 1997 (\$ in Thousands)

- (U) \$484 Continued HBE development
- (U) \$650 Continued TRACS development
- (U) \$ 49 Travel
- (U) \$499 New Signal Development
- (U) \$1,682 Total

(U) FY 1998 (\$ in Thousands)

- (U) \$100 Complete HBE development
- (U) \$890 Continued TRACS development
- (U) \$223 New Signal Development
- (U) \$1,213 Total

(U) FY 1999 (\$ in Thousands)

- (U) \$250 Complete TRACS development
- (U) \$532 New Signal Development
- (U) \$782 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604270F EW Development			PROJECT 2462		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>					
				<u>Cost</u>					
(U) Previous President's Budget	1,682	1,284	798	TBD					
(U) Appropriated Value	1,718								
(U) Adjustments to Appropriated Value									
a. General Congressional Reductions	-36	-42							
b. SBIR		-29							
c. Omnibus/Other Above Threshold Reprogramming									
d. Below Threshold Reprogramming									
e. Rescissions									
(U) Adjustments to Budget Years Since FY 1998 PB			-16						
(U) Current Budget Submit/1999 President's Budget	1,682	1,213	782	TBD					
(U) Change Summary Explanation:									
Funding: None.									
Schedule: None.									
Technical: None.									
(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) Aircraft Procurement, AF PE 27253F (Compass Call)									
(U) Mods (Compass Call; MN 1001) BA-5	2,997	7,552	7,802	7,975	8,156	8,648	8,830	Cont.	N/A
(U) Acft Replen Spares & Repairs BA-6	585	5,867	0	0	0	0	0	Cont.	N/A
(U) Acft Initial Spares & Repairs BA-6	1	0	1,743	9,379	9,984	13,194	8,997	Cont.	N/A
(U) Other Charges BA-7	0	0	24,647	27,747	49,882	48,644	27,075	Cont.	N/A
(U) TOTAL	3,583	13,419	34,192	45,101	68,022	70,486	44,902	Cont.	N/A
Project 2462									
Page 11 of 37 Pages									
Exhibit R-2 (PE 0604270F)									

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 2462
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(U) **D. Schedule Profile:**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) HBE Flight Test					*	X	X	X				
(U) HBE PDR									X			
(U) TRACs Initial Flight Testing				*	*	X	X	X				
(U) TRACS PDR											X	

* Denotes completed activity

X Denotes planned activity

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 2462
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(U) A. Project Cost Breakdown (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) HBE/HBS	484	100	0
(U) TRACS	650	890	250
(U) Travel	49	0	0
(U) New Signal Development	<u>499</u>	<u>223</u>	<u>532</u>
(U) Total	1682	1,213	782

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands):

Performing Organizations:

Contractor or Government	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
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Product Development Organizations

Raytheon (IN)	SS/CPAF	2QFY98	N/A	N/A	22,739	484	100	0	0	23,323
GTE	SS/CPIF	2QFY98	N/A	N/A	8,875	0	200	400	0	9,475
LM-Sanders	SS/CPIF	2QFY98	N/A	N/A	25,556	650	847	332	0	27,385

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY					PE NUMBER AND TITLE				PROJECT	
5 - Engineering and Manufacturing Development					0604270F EW Development				2462	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands):</u> (Continued)										
Performing Organizations: (Continued)										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Support and Management Organizations</u>										
Misc (SPO, Labs)	Various	*1-4Q			2,718	454	0	0	Continuing	TBD
<u>Test and Evaluation Organizations:</u> Air Warfare Center conducts tests using its own funds.										
* Obligation dates are accomplished on a continuous basis.										
Government Furnished Property:										
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>		<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>										
Misc	Misc				1,500	94	66	50	Continuing	TBD
<u>Support and Management Property</u>										
None										
<u>Test and Evaluation Property</u>										
None										
Project 2462					Page 14 of 37 Pages			Exhibit R-3 (PE 0604270F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 2462
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<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>PROJECT</u>
Subtotal Product Development Organizations				58,767	1,228	1,213	782	0	60,183
Subtotal Support and Management				2,718	454	0	0	Continuing	TBD
Subtotal Test and Evaluation				0	0	0	0	Continuing	TBD
Total Project				61,485	1,682	1,213	782	Continuing	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604270F EW Development				PROJECT 3891		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
3891 Advanced IR Countermeasures (AIRCМ) (Includes CMWS, ASTE, LAIRCМ and AAR-47)*	39,725	34,852	37,335	40,545	21,472	15,595	11,564	0	300,786	
** Quantity of RDT&E Articles										
CMWS Qty / \$	0 / 12,250	10 / 3,500	40 / 3,161	0	0	0	0	N/A	N/A	
ASTE Qty / \$	3,963 / 645	3,062 / 817	0 / 0	0	0	0	0	N/A	N/A	
<p>* AIRCM includes four subprojects: Common Missile Warning System (CMWS), Advanced Strategic and Tactical Infrared Expendables (ASTE), Large Aircraft IRCM (LAIRCМ), and software upgrade to AAR-47.</p> <p>** FY97 CMWS dollar values reflect developmental phase efforts. FY97/98 ASTE dollar values reflect developmental phase efforts.</p> <p>(U) A. <u>Mission Description and Budget Item Justification:</u> The AIRCM project contains related aircraft self-protection efforts aimed at increasing aircraft survivability against increasing threat of sophisticated surface to air and air to air missile threats. AIRCM consists of four efforts, the tri-service Common Missile Warning System (CMWS), USAF/USN Advanced Strategic and Tactical Infrared Expendable (ASTE), USAF Large Aircraft IRCM (LAIRCМ), and USAF/USN AAR-47 software upgrade. CWMS will provide timely warning of a threat missile attack with planned growth to directable countermeasures. ASTE will provide advanced expendable countermeasures. LAIRCМ will demonstrate an advanced directed laser countermeasures suite for large signature aircraft as EMD risk reduction. The software upgrade to the AAR-47 is aimed at improving its false alarm rate. The AIRCM project objective is to increase aircraft survivability against advanced SAMs, which may employ such features as next-generation electro-optics, dual infrared and radio frequency seekers, and will result in an integrated, self-protection capability tailored for current generation combat, airlift and special operations aircraft. This project was formed in FY96 by combining the FY95 USA Advanced Threat Infrared Countermeasures (ATIRCМ) program with the USAF/USN Advanced Missile Warning program and the Advanced Strategic and Tactical Infrared Expendables effort. CMWS and ASTE entered EMD in Jun 95. USAF CMWS installation is planned for the F-16 and A-10 aircraft. ASTE flares will be functionally compatible with existing dispenser systems and will be employed across multiple USAF and USN weapon systems. This project, managed as a consolidated AIRCM effort, is an integral part of a Joint Service IRCM program that will maximize commonality across Air Force, Navy, and Army aircraft.</p> <p>(U) <u>Acquisition Strategy:</u> The acquisition strategy is competitive cost-plus award fee.</p>										
Project 3891			Page 16 of 37 Pages				Exhibit R-2 (PE 0604270F)			

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BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
0604270F EW Development

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		February 1998
PE NUMBER AND TITLE 0604270F EW Development		PROJECT 3891
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> (Continued)</p> <p>(U) <u>FY1997 (\$ in Thousands)</u></p> <p>AIRCM (Includes CMWS, ASTE, LAIRCM, and AAR-47)</p> <p>(U) CMWS Program:</p> <ul style="list-style-type: none"> - (U) \$23,531 Common Missile Warning System Joint Program Costs - (U) \$4,253 F-15 aircraft (Group A) EMD integration - (U) \$833 F-16 aircraft (Group A) EMD integration - (U) \$408 A-10 aircraft (Group A) EMD integration - (U) \$3,815 Test and Evaluation (AF only) - (U) \$446 Modeling and Simulation (AF only) - (U) \$1,844 Mission Support - (U) \$35,130 Total <p>(U) ASTE Program:</p> <ul style="list-style-type: none"> - (U) \$2,000 Joint Program Costs - (U) \$ 750 Test and Evaluation - (U) \$ 296 Verification and Validation - (U) \$ 369 Modeling & Analysis - (U) \$1,180 Mission Support - (U) \$4,595 Total <p>(U) LAIRCM Program:</p> <ul style="list-style-type: none"> - (U) \$ 0 <p>(U) AAR-47 Program:</p> <ul style="list-style-type: none"> - (U) \$ 0 <p>- (U) \$ 39,725 AIRCM Total</p>		
Project 3891	Page 17 of 37 Pages	Exhibit R-2 (PE 0604270F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		February 1998
PE NUMBER AND TITLE 0604270F EW Development		PROJECT 3891
(U) A. Mission Description and Budget Item Justification: (Continued)		
(U) CMWS Program:		
(U) <u>FY 1998 (\$ in Thousands)</u>		
-	(U) \$8,370	Common Missile Warning System Joint Program Costs
-	(U) \$3,599	F-16 aircraft (Group A) EMD integration
-	(U) \$2,173	A-10 aircraft (Group A) EMD integration
-	(U) \$7,229	Test and Evaluation (AF only)
-	(U) \$ 715	Modeling and Simulation (AF only)
-	(U) \$2,584	Mission Support
-	(U) \$24,670	CMWS Total
(U) ASTE Program:		
-	(U) \$	ASTE Joint Program Costs
994		
-	(U) \$5,175	C-17 Development
-	(U) \$1,374	Test and Evaluation
-	(U) \$ 600	Verification and Validation
-	(U) \$ 469	Modeling & Analysis
-	(U) \$1,570	Mission Support
-	(U) \$10,182	ASTE Total
(U) LAIRCM Program.		
	(U) \$ 0	
(U) AAR-47 Program:		
	(U) \$ 0	
	(U)	AIRCM Total
	\$34,852	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		February 1998
5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE	PROJECT
	0604270F EW Development	3891
(U) A. Mission Description and Budget Item Justification: (Continued)		
(U) FY1999 (\$ in Thousands)		
(U) CMWS Program:		
- (U)	\$6,918	Common Missile Warning System Joint Program Costs
- (U)	\$9,251	F-16 aircraft (Group A) EMD integration
- (U)	\$5,000	A-10 aircraft (Group A) EMD integration
- (U)	\$7,714	Test and Evaluation (AF only)
- (U)	\$1,320	Modeling and Simulation (AF only)
- (U)	\$4,499	Mission Support
- (U)	\$34,702	CMWS Total
ASTE Program:		
- (U)	\$	ASTE Joint Program Cost
	0	
- (U)	\$ 400	C-17 Development
- (U)	\$ 428	Test and Evaluation
- (U)	\$ 100	Modeling and Analysis
- (U)	\$ 248	Mission Support
- (U)	\$1,176	ASTE Total
LAIRCM Prog:		
- (U)	\$ 100	Installation Analysis
- (U)	\$ 450	Technology Transition & Affordability Analysis
- (U)	\$ 150	Modeling and Simulation
- (U)	\$ 77	Mission Support
- (U)	\$ 777	LAIRCM Total
AAR-47 Prog.		
- (U)	\$ 200	Data Collection
- (U)	\$ 480	Modeling and Analysis
- (U)	\$ 680	AAR-47 Total
- (U)	\$37,335	AIRCM Total

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3891
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	40,913	31,983	38,088	TBD
(U) Appropriated Value	42,802	36,983		
(U) Adjustments to Appropriated Value				
a. General Congressional Reduction	-919	-1,289		
b. SBIR	-970	-842		
c. Omnibus/other Above Threshold Reprogramming	-1,110			
d. Below Threshold Reprogramming				
e. Rescissions	-78			
(U) Adjustment to budget year Since FY 1998 PB			-753	
(U) Current Budget Submit/1999 President's Budget	39,725	34,852	37,335	TBD

(U) B. Program Change Summary (\$ in Thousands): (Continued)

(U) Change Summary Explanation:

Funding: \$1,110K from AIRCM was a FY97 Omnibus source. Funding for LAIRCM and AAR-47 separated from CMWS and ASTE programs in FY99

Schedule: CMWS: Platform Integration, DT&E, IOT&E and MSIII have slipped outward due to delays in hardware availability and shortfalls in FY98 Army funding. LAIRCM and AAR-47 start in FY99.

ASTE: The Covert test dates moved to the right one quarter because the program was re-baselined to change the form factor of the Navy's expendables (the Navy and AF expendables are now common). This combined the Covert and Fighter test programs and a combined MSIII review has moved one quarter to the right. ASTE is still within the Acquisition Program baseline (APB) schedule.

LAIRCM: Begin large aircraft testbed integration for airborne demonstration of two color IR missile warning, mini jamhead and multi-band laser, closed loop IR countermeasures system.

AAR-47 Software Upgrade: Begin software development to improve AAR-47 false alarm rates.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3891
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Technical: ASTE: ASTE program changes reflect recent USN decision to pursue square flare form factor design (current USAF configuration) making the new flare common across the two services.

 LAIRCM: Begin large aircraft testbed integration for airborne demonstration of two color IR missile warning, mini jamhead and multi-band laser, closed loop IR countermeasures system.

 AAR-47 Software Upgrade: Collect/Analyze data.

(U) C. Other Program Funding Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Aircraft Procurement, AF, PE 27442F Mods, F-16/A-10 CMWS, BA-5		11		27,060	49,411	72,886	100,044	590,393	839,805
(U) Procurement of Ammunition, AF, PE 28030F ASTE flares, BA-1, Appn 3011			5,000	4,968	4,975	4,982	4,989	Cont.	Cont.
(U) RDT&E, AF, PE 63270F EO/IR Warning & Countermeasures, BA-3	13,050	13,809	9,167	10,889	13,303	11,119	11,119	Cont.	Cont.

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3891
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(U) D. Schedule Profile:

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
(U) Project 3891, AIRCM	1	2	3	4	1	2	3	4	1	2	3	4
(U) ASTE PDR - Fighter	*											
(U) ASTE PDR - Covert												
(U) ASTE CDR - Fighter			*									
(U) ASTE CDR - Covert				*								
(U) ASTE DT&E - Fighter/Covert					*	X						
(U) ASTE OT&E - Fighter/Covert								X				
(U) ASTE MS III - Fighter/Covert											X	
(U) ASTE CDR - Transport										X		
(U) ASTE DT&E-Transport												X
(U) ASTE OT& -Transport (Mar00)												
(U) ASTE PDR - B-1B									X			
(U) CMWS CDR	*	*										
(U) CMWS Contractor Qual Test							X					
(U) CMWS Platform Integration								X				
(U) CMWS DT&E										X		
(U) CMWS IOT&E												X
(U) CMWS MSIII (Mar 01)												
(U) LAIRCM Testbed Design CDR												X
(U) AAR-47 SW Upgrade Contract										X		

* Denotes completed activity
X Denotes planned activity

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE
5 - Engineering and Manufacturing Development		February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604270F EW Development	3891
(U) A. <u>Project Cost Breakdown (\$ in Thousands)(Continued):</u>		
	<u>FY 1997</u>	<u>FY 1998</u>
		<u>FY 1999</u>
(U) LAIRCM Program		
(U) LAIRCM Installation Analysis		100
(U) LAIRCM Tech Transition/Affordability Planning		450
(U) LAIRCM Modeling and Simulation		150
(U) LAIRCM Development Mission Support		77
Sub-Total (LAIRCM)		777
(U) AAR-47 Program		
(U) AAR-47 Data Collection		200
(U) AAR-47 Modeling & Analysis		480
Sub-Total (AAR-47)		680
Total (CMWS, ASTE, LAIRCM, and AAR-47)	39,725	34,852
		37,335

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3891
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands):

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Product Development Organizations

Prime Contractors:

ASTE - Tracor	CPAF	Nov 95	14,893	14,893	6,314	2,010	6,169	400	0	14,893
CMWS - Sanders	CPAF	Sep 95	48,717	48,717	17,990	18,418	4,760	3,893	3,656	48,717
CMWS Update	TBD	TBD	25,379	25,379	0	0	0	0	25,379	25,379
CMWS Integration (Airframe Contractors)	CPAF	Various	73,513	73,513	16,762	5,494	5,772	14,251	31,234	73,513
LAIRCM - LMTDS	CPFF	Aug 94	4,609	4,609	0	0	0	690	3,919	4,609
AAR-47 - GTRI	TBD	2Q99	TBD	1445	0	0	0	680	765	1445
Total Product Development			TBD	TBD	41,066	25,922	16,701	19,914	64,953	168,556

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604270F EW Development				PROJECT 3891	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands):</u> (Continued)										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Support and Management Organizations</u>										
ASTE M&A -SAIC	PR		2,118	2,118	780	369	469	100	400	2,118
ASTE V&V Mac B	PR		1,156	1,156		226	600	0	330	1,156
ASTE-Misc	Various		37,766	37,766	34,220	1,240	1,570	248	748	37,997
CMWS - CAS, Inc	CPFF	Sep 95	30,560	30,560	9,717	5,113	3,610	3,025	9,095	30,560
CMWS - AOA	FP	Jun 97	4,205	4,205		927	1,061	1,092	1,125	4,205
CMWS - Mod & Sim	CPFF Various	Sep 95 Various	5,216 19,044	5,216 19,044	1,850 5,080	446 917	715 1,523	1,320 3,407	885 8,321	5,216 18,895
CMWS - Misc Partnership Process					2,000					2,000
LAIRCM	TBD	TBD	TBD	157	0	0	0	77	80	157
Total Support & Mgmt			TBD	100,222	53,647	9,238	9,548	9,269	20,984	102,686

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604270F EW Development				PROJECT 3891	
Performing Organizations: (Continued)										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Test and Evaluation Organizations</u>										
CMWS										
(46TW or Navy test organization)	Various	2QFY97	25,805	25,805	4,984	3,815	7,229	7,714	2,350	26,092
ASTE - 46TW or OTEVFOR or PAX-RIVER	Various	2QFY97	3,629	3,629	0	750	1,374	428	850	3,402
LAIRCM - 46TW	Various	TBD	50	50	0	0	0	10	40	50
Total Test and Eval			29,484	29,484	4,984	4,565	8,603	8,152	3,240	29,544
Project 3891										
Page 27 of 37 Pages										
Exhibit R-3 (PE 0604270F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)					DATE February 1998	
BUDGET ACTIVITY		PE NUMBER AND TITLE			PROJECT	
5 - Engineering and Manufacturing Development		0604270F EW Development			3891	
Government Furnished Property: Not Applicable						
		<u>Total</u>				
		<u>Prior to</u>	<u>Budget</u>	<u>Budget</u>	<u>Budget</u>	<u>Total</u>
		<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Program</u>
					<u>Budget to</u>	
					<u>Complete</u>	
Subtotal Product Development		41,066	25,922	16,701	19,914	64,953
Subtotal Support and Management		53,647	9,238	9,548	9,269	20,984
Subtotal Test and Evaluation		4,984	4,565	8,603	8,152	3,240
Total Project		99,697	39,725	34,852	37,335	89,177
						300,786

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604270F EW Development			PROJECT 3945			
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3945	RF Towed Decoy Systems	42,086	30,717	42,208	31,691	28,609	36,319	31,662	Continuing	TBD
Quantity of RDT&E Articles										
B-1 Qty/\$ (IDECM Only)		N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
F-15 Qty/\$ (IDECM Only)		N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*	N/A*
<p>*Note: RDT&E funds are used for integration, lab, and test assets. Hardware is purchased by component, not as a complete upgrade kit, therefore aircraft quantity/\$ does not accurately portray the IDECM Program.</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) This project develops, integrates and tests radio frequency (RF) towed decoy systems on several aircraft. RF towed decoys are low cost, end game countermeasures that provide increased survivability against monopulse, semi-active, and active RF missile threats. The program is developing two classes of decoy systems, the ALE-50 and the Integrated Defensive Electronic Countermeasures (IDECM). Both of these efforts are joint programs with the Navy as lead service. Air Force funding pays for unique Air Force development requirements and integration and test on Air Force platforms.</p> <p>(U) ALE-50: The Air Force ALE-50 program is developing, integrating, and testing a modified version of the Navy's ALE-50 decoy system for the F-16 and B-1B. The components of the F-16 system include: the F-16 pylon assembly (modified 16S350 pylon), launcher/controller, magazines, canister, towline assembly, and the ALE-50 decoy called the Advanced Airborne Expendable Decoy (AAED). The major components of the B-1B system include: the multi-platform launch controller (MPLC), launcher, magazine, canister, towline assembly and the AAED.</p> <p>(U) IDECM: The Navy's goal in IDECM is to develop an integrated ECM suite for the F/A-18E/F. The Air Force is participating in IDECM to jointly develop a common IDECM techniques generator (TG) and a high power Fiber Optic Towed Decoy (FOTD). Air Force funding pays for unique Air Force development costs under IDECM as well as integration and test on the F-15. The Defensive Suppression Upgrade Program (DSUP) program will fund integration and test of IDECM hardware on the B-1B.</p> <p>(U) <u>Acquisition Strategy:</u></p> <p>The acquisition strategy for ALE-50 is sole source, cost-plus. The acquisition strategy for IDECM is competitive, cost-plus.</p>										
Project 3945		Page 29 of 37 Pages				Exhibit R-2 (PE 0604270F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3945
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(U) **A. Mission Description and Budget Item Justification - (Continued)**

(U) FY 1997 (\$ in Thousands):

- (U) \$9,687 ALE-50 Common
- (U) \$7,473 ALE-50 B-1
- (U) \$8,941 IDECM Common
- (U) \$2,488 IDECM F-15
- (U) \$10,395 Test Support
- (U) \$3,102 Mission Support
- (U) \$42,086 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$177 ALE-50 Common
- (U) \$3,134 ALE-50 B-1
- (U) \$13,365 IDECM Common
- (U) \$11,600 IDECM F-15
- (U) \$1,048 IDECM Mission Support
- (U) \$250 ALE-50 Test Support
- (U) \$1,143 ALE-50 Mission Support
- (U) \$30,717 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$12,505 IDECM Common
- (U) \$28,600 IDECM F-15
- (U) \$1,103 Mission Support
- (U) \$42,208 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3945
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	44,225	35,708	43,059	TBD
(U) Appropriated Value	46,240	32,708		
(U) Adjustments to Appropriated Value				
a. General Congressional Reductions	-968	-1,248		
b. SBIR	-1,047	-743		
c. Omnibus or Other Above Threshold Reprogram	-2,056			
d. Below Threshold Programming				
e. Rescissions	-83			
(U) Adjustments to Budget Years Since FY 1998 PB			-851	
(U) Current Budget Submit / 99 President's Budget	42,086	30,717	42,208	TBD

(U) Change Summary Explanation:

Funding: None.

Schedule: B-1 AAED 1st Flight Readiness Review slid to Jan 97 due to more time required for OT&E Report. B-1 DSUP MS II slid from 2Q CY97 to 3Q CY97 due to JROC schedule change. F-15/IDECM Integration contract delay due to ORD development delays.

Technical: None.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3945
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY1997</u>	<u>FY1998</u>	<u>FY1999</u>	<u>FY2000</u>	<u>Fy2001</u>	<u>FY2002</u>	<u>FY2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Aircraft Procurement, AF PE 27442F									
(U) Mods (F-16 &B-1B), BP-11	18,301	63,020			6,531	16,661	29,534	Cont	TBD
(U) War Consumables (decoys), BP-17	26,306	33,136	25,606	31,093	47,721	59,225	97,965	Cont	TBD
(U) Aircraft Procurement, AF PE 27133F									
(U) Mods (F-16), BP-11			18,662	18,176	18,334	5,143	1,426	0	61,741
(U) Aircraft Procurement, AF PE 11126F									
(U) Mods (B-1B), BP-11			33,124	39,054	38,458	32,348	5,904	7,896	156,784

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3945
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
1	2	3	4	1	2	3	4	1	2	3	4	
(U) F-16 ALE-50 Milestone III	*											
(U) B-1B 1st Flight Readiness Review	*											
(U) B-1 DSUP Milestone II		*										
(U) B-1B ALE-50 Milestone III					X							
(U) F-15/IDECM Integration Decision MSII			*									
(U) F-15/IDECM Integration Contract Award								X				
(U) IDECM DT/OT&E						X						
(U) IDECM DT2B						X						
(U) First USAF Subsystem Delivery (IDECM)							X					
(U) IDECM Functional Quality Test								X				
(U) F-15/IDECM CDR									X			
(U) F-15/IDECM TRR										X		
(U) F-15/IDECM DT/OT&E						X						

* Denotes completed activity

X Denotes planned activity

Note: See Change Summary

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3945
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) ALE-50 Common	9,687	177	0
(U) ALE-50 B-1	7,473	3,134	0
(U) IDECM Common	8,941	13,365	12,505
(U) IDECM F-15	2,488	11,600	28,600
(U) Mission and Test Support	13,497	2,441	1,103
 (U) Total	 42,086	 30,717	 42,208

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604270F EW Development				PROJECT 3945	
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Prime Contractors										
B-1 ALE-50 - Rockwell/ (Boeing North American)	CPAF	Apr 95	23,088	23,088	*	7,473	3,134	0.00	0.00	TBD
ESGD- Raytheon										
USAF AN/ALE-50 EMD Support Contract - ESGD Raytheon	CPIF/ FFP/ T&M	Jan 96	9,016	9,016	*	8,684	177	0.00	0.00	TBD
USAF IDECM Development - Sanders Development - ESGD	CPAF /CPIF	Nov 95			*					TBD
			34,000	34,000		8,383	7,442	9,611		
			7,000	7,000		116	5,162	1,644		
F-15 IDECM Integration - McAir/Northrop/Lockheed-Martin	CPFF	Aug 97	102,800	102,800	*	2,448	11,600	28,600		TBD
ALQ-184(v)9 ESGD-Raytheon	Misc	Jan 96	7,791	8,096	*	1,003	0.00	0.00	TBD	TBD
Misc Development Contracts	CPFF				*	442	761	1,250		TBD
Total Prime					*	28,589	28,276	41,105	TBD	TBD
* Funding for this effort transferred from multiple formerly classified projects in FY97.										
Project 3945			Page 35 of 37 Pages				Exhibit R-3 (PE 0604270F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604270F EW Development				PROJECT 3945	
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands): (Continued)										
Performing Organizations: (Continued)										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Support and Management Organizations and Economic Change Orders</u>										
ASC/SM/YF										
ALE-50	Misc	Sep 98	N/A		*	1,551	1,143	0.00	TBD	TBD
IDEC			N/A		*	<u>1,551</u>	<u>1,048</u>	<u>1,103</u>	<u>TBD</u>	<u>TBD</u>
Total Support & Management					*	3,102	2,191	1,103	TBD	TBD
<u>Test and Evaluation Organizations</u>										
AFOTEC		Sep 98	N/A		*	2,280	250	0.00	TBD	TBD
AFFTC			N/A		*	7,805	0.00	0.00	TBD	TBD
Edwards			N/A		*	10	0.00	0.00	TBD	TBD
ALQ 184v(9) Flight Test			N/A		*	<u>300</u>	<u>0.00</u>	<u>0.00</u>	<u>TBD</u>	<u>TBD</u>
Total Test & Evaluation					*	10,395	250	0.00	TBD	TBD
* Funding for this effort transferred from multiple formerly classified projects in FY97.										
Government Furnished Property: None.										
Project 3945			Page 36 of 37 Pages				Exhibit R-3 (PE 0604270F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604270F EW Development	PROJECT 3945
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands): (Continued)

<u>Item Description</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development	*	28,589	28,276	41,105	TBD	TBD
Subtotal Support and Management	*	3,102	2,191	1,103	TBD	TBD
Subtotal Test and Evaluation	*	<u>10,395</u>	<u>250</u>	<u>0</u>	<u>TBD</u>	<u>TBD</u>
 Total Project	 *	 42,086	 30,717	 42,208	 TBD	 TBD

* Funding for this effort transferred from multiple formerly classified projects in FY97.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604441F Space Based IR Arch (EMD) (Space)
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	193,018	316,467	538,438	564,239	395,905	269,798	143,059	350,725	2,801,661
3616 SBIRS High Element EMD	189,318	316,467	538,438	564,239	395,905	269,798	143,059	350,725	2,760,563
0002 Miniature Sensor Technology Integration (MSTI)	3,700	0	0	0	0	0	0	0	41,098
Quantity of RDT&E Articles	0	0	0	0	1*	1*	2*	0	4

Notes: Unit cost not available.

SBIRS Low EMD funding previously included in this PE was transferred to PE #604442F to establish a SBIRS Low EMD Program Element.

*One each HEO sensor delivered in FY01 and FY03, one each GEO spacecraft delivered in FY02 and FY03

(U) A. Mission Description and Budget Item Justification

(U) The Space-Based Infrared System's (SBIRS) primary mission is to provide initial warning of a ballistic missile attack on the US, its deployed forces or its allies. SBIRS will incorporate new technologies to enhance detection; improve reporting of ICBM, SLBM and tactical ballistic missiles; and provide critical mid-course tracking and discrimination data for national and theater missile defense. This will provide increased performance in order to meet requirements in US Space Command's Capstone Requirement Document and Operations Requirements Document. SBIRS will consist of satellites in Geosynchronous Orbits (GEO), Highly Elliptical Orbits (HEO) and Low Earth Orbits (LEO) and an integrated centralized ground station serving all SBIRS space elements and Defense Support System (DSP) satellites. Funding was provided in FY97 for the Miniature Sensor Technology Integration (MSTI) program which completed in FY97. This Program Element funds SBIRS Engineering and Manufacturing Development (EMD) activities and is assigned to Budget Activity 5, Engineering and Manufacturing Development.

(U) Acquisition Strategy:

(U) SBIRS is a lead program for acquisition streamlining. Program documentation has been consolidated into a single document, the Single Acquisition and Management Plan (SAMP). The pre-EMD contracts were competed in full and open competition. Two contracts were awarded to Lockheed/Loral/Aerojet and Hughes/TRW for the pre-EMD phase. A single contract was awarded to Lockheed Martin for the EMD phase.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY			PE NUMBER AND TITLE							
5 - Engineering and Manufacturing Development			0604441F Space Based IR Arch (EMD) (Space)							
(U) B. Program Change Summary (\$ in Thousands)										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U)	Previous President's Budget(FY1998 PB)	189,638	338,413	580,298	2,980,497					
(U)	Appropriated Value	199,190	338,413							
(U)	Adjustments to Appropriated Value									
	a. Cong Gen Reductions	-4,689	-13,580							
	b. SBIR	-4,863	-8,366							
	c. Omnibus or Other Above Threshold Reprogram									
	d. Below Threshold Reprogramming	3,700								
	e. Rescissions	-320								
(U)	Adjustments to Budget Years Since FY1998 PB			-41,860						
(U)	Current Budget Submit/FY 1999 President's Budget	193,018	316,467	538,438	2,801,661					
(U) Change Summary Explanation:										
Funding: FY97 BTR of \$3,700K for MSTI. \$320K supports congressional rescissions for the Bosnia supplemental.										
\$2,279K FY98 RDT&E is pending reprogramming to fund higher priority AF requirements.										
\$10.86M FY99 reduction for Non Pay inflation, \$31.0M realigned to PE 64442F to establish a SBIRS Low EMD program element.										
In order to maintain the program baseline, \$21.6M FY98 Above Threshold Reprogramming and \$25.9M Special Termination Cost Clause waiver will be submitted to Congress in early March 1998. Additional shortfalls are being fixed through internal program restructuring.										
Schedule: Not Applicable										
Technical: Not Applicable										
(U) C. Other Program Funding Summary (\$ in Thousands)										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U)	Missile Procurement (PE 0305915F, BA-45, P-1-N/A)	0	0	0	0	33,510	214,402	188,455	5,478,000	5,914,367
Related RDT&E:										
(U)	PE 603441F - SBIRS Dem/Val	252,492	202,433	160,262	154,133	115,398	0	0	0	1,432,558
(U)	PE 305911F - DSP	24,668	20,689	12,037	7,595	7,587	4,462	4,760	0	1,941,972
(U)	PE 604442F - SBIRS Low EMD	0	0	33,328	79,064	148,749	420,206	823,950	5,938,759	7,444,056

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604441F Space Based IR Arch (EMD) (Space)
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) EMD Authority To Proceed (ATP)	X											
(U) Preliminary Requirements Review (PPR)		X										
(U) GRND INC-1 Interim Design Review		X										
(U) HOSV/Spacecraft Prelim Design Revw				X								
(U) GRND INC-2 Interim Design Review					X							
(U) System Preliminary Design Review					X							
(U) Payload Critical Design Review									X			
(U) HOSV/Spacecraft Critical Design Review										X		
(U) System Critical Design Review											X	
(U) Consolidated Ground IOC for DSP												X
(U) Ground IOC for HIGH (FY01)												
(U) First HEO Delivery (FY01)												
(U) First GEO Launch (FY02)												

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604441F Space Based IR Arch (EMD) (Space)				PROJECT 3616	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3616 SBIRS High Element EMD	189,318	316,467	538,438	564,239	395,905	269,798	143,059	350,725	2,760,563
<p>(U) A. <u>Mission Description and Budget Item Justification</u> (U) The Space-Based Infrared System's (SBIRS) primary mission is to provide initial warning of a ballistic missile attack on the US, its deployed forces or its allies. SBIRS will incorporate new technologies that would enhance detection; improve reporting of ICBM, SLBM and tactical ballistic missiles; and provide critical mid-course tracking and discrimination data for national and theater missile defense. The system will consist of satellites in Geosynchronous Orbits (GEO), Highly Elliptical Orbits(HEO) and Low Earth Orbits (LEO) and an integrated, centralized ground station serving all space elements of the SBIRS system and the Defense Support Program (DSP) satellites. This Program Element funds SBIRS High Engineering and Manufacturing Development (EMD) activities and is assigned to Budget Activity 7, Engineering and Manufacturing Development.</p> <p><u>(U) Acquisition Strategy:</u> (U) SBIRS is a lead program for acquisition streamlining. The pre-EMD contracts were competed in full and open competition. Two contracts were awarded to Lockheed/Loral/Aerofjet and Hughes/TRW for the pre-EMD phase. A single contract was awarded to Lockheed Martin for the EMD phase.</p> <p>(U) <u>FY 1997</u></p> <ul style="list-style-type: none"> - (U) \$171,918 Initiated EMD contracts for Space and Ground segment development - (U) \$ 7,200 Continued System Program Office Support - (U) \$ 10,200 Technical analysis and independent verification and validation of contractor by FFRDC - (U) \$189,318 Total <p>(U) <u>FY 1998</u></p> <ul style="list-style-type: none"> - (U) \$294,988 Continue EMD contracts for Space and Ground segment development - (U) \$ 9,000 Continue System Program Office Support - (U) \$ 2,279 Reserved for Anticipated Cut for Inflation Adjustment and Small Business Innovative Research - (U) \$ 10,200 Technical analysis and independent verification and validation of contractor by FFRDC - (U) \$316,467 Total <p>(U) <u>FY 1999</u></p> <ul style="list-style-type: none"> - (U) \$518,838 Continue EMD contracts for Space and Ground segment development - (U) \$ 9,400 Continue System Program Office Support - (U) \$ 10,200 Technical analysis and independent verification and validation of contractor by FFRDC 									
Project 3616			<i>Page 4 of 11 Pages</i>				Exhibit R-2 (PE 0604441F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY			PE NUMBER AND TITLE				PROJECT			
5 - Engineering and Manufacturing Development			0604441F Space Based IR Arch (EMD) (Space)				3616			
- (U) \$ 538,438 Total										
(U) B. Program Change Summary (\$ in Thousands)										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget(FY 1998 PB)		189,638	338,413	580,298	2,939,399					
(U) Appropriated Value		189,638	338,413							
(U) Adjustments to Appropriated Value										
a. Cong Gen Reductions			-13,580							
b. SBIR			-8,366							
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming										
e. Rescissions		-320								
(U) Adjustments to Budget Years Since FY 1998 PB				-41,860						
(U) Current Budget Submit/ FY 1999 President's Budget		189,318	316,467	538,438	2,760,563					
(U) Change Summary Explanation:										
Funding: FY97 BTR of \$3,700K for MSTI. \$320K supports congressional rescissions for the Bosnia supplemental.										
\$2,279K FY98 RDT&E is pending reprogramming to fund higher priority AF requirements.										
\$10.86M FY99 reduction for Non Pay inflation, \$31.0M realigned to PE 64442F to establish a SBIRS Low EMD program element.										
In order to maintain the program baseline, \$21.6M FY98 Above Threshold Reprogramming and \$25.9M Special Termination Cost Clause waiver will be submitted to Congress in early March 1998. Additional shortfalls are being fixed through internal program restructuring.										
Schedule: Not Applicable										
Technical: Not Applicable										
(U) C. Other Program Funding Summary (\$ in Thousands)										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) Missile Procurement (PE 0305915F, BA-45, P-1-N/A)		0	0	0	0	33,510	214,402	188,455	5,478,000	5,914,367
Related RDT&E:										
(U) PE 603441F - SBIRS Dem/Val		252,492	202,433	160,262	154,133	115,398	0	0	0	1,432,558
(U) PE 305911F - DSP		24,668	20,689	12,037	7,595	7,587	4,462	4,760	0	1,941,972
(U) PE 604442F - SBIRS Low EMD		0	0	33,328	79,064	148,749	420,206	823,950	5,938,759	7,444,056
Project 3616		Page 5 of 11 Pages						Exhibit R-2 (PE 0604441F)		

DATE
February 1998

BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
0604441F Space Based IR Arch (EMD) (Space)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604441F Space Based IR Arch (EMD) (Space)						PROJECT 3616	
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) EMD Authority To Proceed (ATP)	X											
(U) Preliminary Requirements Review (PPR)		X										
(U) GRND INC-1 Interim Design Review		X										
(U) GRND INC-1 Final Design Review				X								
(U) Payload Preliminary Design Review				X								
(U) HOSV/Spacecraft Preliminary Design Rev					X							
(U) GRND INC-2 Preliminary Design Review					X							
(U) System Preliminary Design Review					X							
(U) Payload Critical Design Review									X			
(U) HOSV/Spacecraft Critical Design Review										X		
(U) GRND INC-2 Critical Design Review										X		
(U) System Critical Design Review											X	
(U) Consolidated Grnd IOC for DSP												X
(U) Grnd IOC for HIGH (FY01)												
(U) First HEO Delivery (FY01)												
(U) First GEO Launch (FY02)												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604441F Space Based IR Arch (EMD) (Space)				PROJECT 3616	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) EMD Contract				171,918	295,767	519,617				
(U) System Program Office Support				7,200	9,000	9,400				
(U) Aerospace Corp				10,200	9,421	9,421				
(U) Adjustment: (Pending Reprogramming for Inf. Adj/SBIR)					2,279					
(U) Total				189,318	316,467	538,438				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government	Contract Method/Type	Award or Obligation Date	Performing Activity	Project Office	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
<u>Product Development Organizations</u>										
LMMS & TRW (Pre-EMD)	C/CPFF	Jul 95	164,943	164,943	164,943	0	0	0	0	164,943
LMMS (EMD)	C/CPAF	Nov 96				171,918	295,767	519,617	1,322,767	2,310,069
TBD(Technology)	Various	Sep 95	11,600	11,600	11,600	0	0	0	0	11,600
TBD(Phenom)	Various	Sep 95	17,350	17,350	17,350	0	0	0	0	17,350
Sandia Nat'l Lab (Cobra Brass)	Various	Sep 95	10,000	10,000	10,000	0	0	0	0	10,000
<u>Support and Management Organizations</u>										
Aerospace Corp	MORD	Sep 95	N/A	N/A	19,200	10,200	9,421	9,421	71,400	119,642
Prgm Mgmt Supt	Various	Sep 95	N/A	N/A	12,900	7,200	9,000	9,400	81,400	119,900
<u>Test and Evaluation Organizations</u>										
Not Applicable										
Project 3616			Page 7 of 11 Pages				Exhibit R-3 (PE 0604441F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604441F Space Based IR Arch (EMD) (Space)	PROJECT 3616
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Government Furnished Property: Not Applicable.										
Subtotal Product Development					203,893	171,918	294,988	518,838	1,322,767	2,513,962
Subtotal Support and Management					32,100	17,400	19,200	19,600	152,800	239,542
Subtotal Test and Evaluation					0	0	0	0	0	0
Adjustment (FY 98 pending reprogramming for inflation adjustments/SBIR)							2,279			7,059
Adjustment (SBIRS Pre-EMD Contract Adjustments)						4,780				
Total Project					240,773	189,318	316,467	538,438	1,475,567	2,760,563

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604441F Space Based IR Arch (EMD) (Space)				PROJECT 0002	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0002 Miniature Sensor Technology Integration (MSTI)	3,700	0	0	0	0	0	0	0	41,098
(U) A. <u>Mission Description and Budget Item Justification</u>									
(U) The Miniature Sensor Technology Integration (MSTI) program provides phenomenology data for the SBIRS program.									
(U) <u>FY 1997</u>									
- (U) \$3,700	Continued on-orbit operations & program support.								
- (U) \$3,700	Total								
(U) <u>FY 1998</u>									
- (U) 0	Total								
(U) <u>FY 1999</u>									
- (U) 0	Total								
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget(FY 1998 PB)	0	0	0	37,398					
(U) Appropriated Value	0								
(U) Adjustments to Appropriated Value									
a. Cong Gen Reductions									
b. SBIR									
c. Internal Realignment Reprogramming									
d. Below Threshold Reprogramming	3,700								
(U) Adjustments to Budget Years Since FY 1998 PB									
(U) Current Budget Submit/ FY 1999 President's Budget	3,700	0	0	41,098					
(U) Change Summary Explanation:									
Funding:	BTR of \$3,700K in FY97 for MSTI continued on-orbit operations and program support.								
Schedule:	Not Applicable								
Technical:	Not Applicable								
Project 0002			Page 9 of 11 Pages				Exhibit R-2 (PE 0604441F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604441F Space Based IR Arch (EMD) (Space)	PROJECT 0002
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
<u>Related RDT&E:</u>									
(U) PE 603441F - SBIRS Dem/Val	252,492	202,433	160,262	154,133	115,398	0	0	0	1,432,558
(U) PE 305911F - DSP	24,668	20,689	12,037	7,595	7,587	4,462	4,760	0	1,941,972
(U) PE 604442F - SBIRS Low EMD	0	0	33,328	79,064	148,749	420,206	823,950	5,938,759	7,444,056

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1
(U) On-orbit Operations	X	X	X						

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604441F Space Based IR Arch (EMD) (Space)				PROJECT 0002	
(U) A. <u>Project Cost Breakdown (\$000 in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	On-orbit Ops and Support				3,700					
(U)	Total Program				3,700	0	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Spectrum Astro	CPAF	Sep 95			44,815	3,700	0	0	0	48,515
<u>Support and Management Organizations</u>										
Not Applicable										
<u>Test and Evaluation Organizations</u>										
Not Applicable										
Government Furnished Property:										
Not Applicable										
Subtotal Product Development					44,815	3,700	0	0	0	48,515
Subtotal Support and Management					0	0	0	0	0	0
Subtotal Test and Evaluation					0	0	0	0	0	0
Adjustment					-7,417	0	0	0	0	-7,417
Total Project					37,398	3,700	0	0	0	41,098

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604442F Space Based IR Arch (EMD) (Space)				PROJECT 4598	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4598 SBIRS Low Element EMD	0	0	33,328	79,064	148,749	420,206	823,950	5,938,759	7,444,056
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Notes: Funding from PE 64441F, BPAC 4598 was transferred to this to establish a SBIRS Low EMD program element.

(U) A. Mission Description and Budget Item Justification

(U) The Space-Based Infrared System's (SBIRS) primary mission is to provide initial warning of a ballistic missile attack on the US, its deployed forces or its allies. SBIRS will incorporate new technologies to enhance detection; improve reporting of ICBM, SLBM and tactical ballistic missiles; and provide critical mid-course tracking and discrimination data for national and theater missile defense. This system will provide increased performance in order to meet requirements in US Space Command's Capstone Requirement Document and Operations Requirements Document. SBIRS will consist of satellites in Geosynchronous Orbits (GEO), Highly Elliptical Orbits (HEO) and Low Earth Orbits (LEO) and an integrated centralized ground station serving all SBIRS space elements and Defense Support System (DSP) satellites. This Program Element funds Program Definition and Engineering, Manufacturing & Development (EMD) activities for the LEO portion of the SBIRS program and is assigned to Budget Activity 5, Engineering and Manufacturing Development.

(U) Acquisition Strategy:

(U) The SBIRS program is managed through a single consolidated System Program Office (SPO) at the Space and Missile Systems Center, Los Angeles Air Force Base, CA. The SBIRS acquisition plan was approved in August 92 and is currently being updated to reflect the FY04 SBIRS Low accelerated launch date. The SBIRS Low EMD contract is scheduled for award 2QFY01 with the first SBIRS Low satellite launch planned in 4QFY04.

(U) FY 1997 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$30,387 SBIRS Low Program Definition activities for Cost as an Independent Variable (CAIV), operational design and risk assessment, operations concept analyses, production planning, life cycle cost projections, and EMD planning
- (U) \$2,941 Radiation Hardened Parts
- (U) \$33,328 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604442F Space Based IR Arch (EMD) (Space)			PROJECT 4598		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget /FY 1998 PB	0	0	0	0					
(U) Appropriated Value									
(U) Adjustments to Appropriated Value									
a. Cong Gen Reductions									
b. SBIR									
c. Omnibus or Other Above Threshold Reprogram									
d. Below Threshold Reprogram									
(U) Adjustments to Budget Years Since FY 1998 PB				+33,328	7,444,056				
(U) Current Budget Submit/FY 1999 President's Budget	0	0	33,328	7,444,056					
(U) Change Summary Explanation:									
Funding: Funding was transferred from PE604441F, BPAC 654598.									
\$2,941K FY99 increase funds for radiation hardened parts. \$672K FY99 reduction for non-pay inflation.									
Schedule: Not Applicable									
Technical: Not Applicable									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
Not Applicable									
<u>Related RDT&E:</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) PE 0603441F - SBIRS Dem/Val	252,492	202,433	160,262	154,133	115,398	0	0	0	1,432,558
(U) PE 0305911F - DSP	24,668	20,689	12,037	7,595	7,587	4,462	4,760	0	1,941,972
(U) PE 0604441F - SBIRS High EMD	193,018	316,467	538,438	564,239	395,905	269,798	143,059	102,566	2,801,661
(U) D. <u>Schedule Profile</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	
(U) Program Definition Contract Award						X			
(U) EMD Contract Award (1QFY01)									
(U) EMD Preliminary Design Review (2Q01)									
(U) SBIRS Low First Launch (4QFY04)									
Project 4598			Page 2 of 3 Pages			Exhibit R-2 (PE 0604442F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604442F Space Based IR Arch (EMD) (Space)				PROJECT 4598		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Program Definition					0	0	\$30,387				
(U) Radiation Hardened Parts					0	0	\$2,941				
(U) Total					0	0	\$33,328				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program	
<u>Product Development Organizations</u>											
TBD	Competitive/ Cost Plus	2QFY99						30,387	7,137,728	7,168,115	
Various	TBD	TBD						2,941	12,000	14,941	
<u>Support and Management Organizations</u>											
Program Support	Various	Various	N/A	N/A	0	0	0	0	261,000	261,000	
<u>Test and Evaluation Organizations:</u>											
Not Applicable											
Government Furnished Property:											
Not Applicable											
Subtotal Product Development					0	0	0	33,328	7,149,728	7,183,056	
Subtotal Support and Management					0	0	0	0	261,000	261,000	
Subtotal Test and Evaluation					0	0	0	0	0	0	
Total Project					0	0	0	33,328	7,410,728	7,444,056	
Project 4598					Page 3 of 3 Pages			Exhibit R-3 (PE 0604442F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604479F Milstar LDR/MDR Sat Comm (Space)				PROJECT 5010	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
5010 Milstar Sat Comm Sys	659,656	628,027	550,940	340,189	181,854	80,643	49,096	282,712	9,689,312
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification
 Milstar is a joint service program to develop and acquire extremely high frequency (EHF) satellites; a satellite mission control segment; and new or modified Army, Navy, and Air Force communication terminals for survivable, jam-resistant, worldwide, secure communications to strategic and tactical warfighters. Milstar I Satellites 1 and 2 have a low data rate (LDR) payload that supports strategic and tactical forces with emphasis on highly survivable, minimum essential communications. Milstar II Satellites 3M-6 have both LDR and medium data rate (MDR) payloads with increased tactical capabilities, including higher data rates to mobile forces and “nulling” that will neutralize close-in enemy jammers. (Satellite 3M was originally a Milstar I satellite, but it is being retrofitted with a MDR payload to function as a Milstar II satellite.) Milstar Terminals are funded under Program Element 0303601F. This program is in Budget Activity 5, Engineering and Manufacturing Development since it funds development of Milstar II.

Acquisition Strategy: Milstar is a sole source contract to Lockheed Martin for LDR/MDR protected communication satellites. Milstar has acquired 6 satellites. The first two satellites were acquired on a competitive basis and were launched in FY94 and FY95. The last 4 satellites will be launched in FY99, 00, 01, and 02.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604479F Milstar LDR/MDR Sat Comm (Space)	5010
(U) <u>FY 1997</u> - (U) \$14,074 Milstar I - (U) Continued Satellites 1 and 2 on-orbit operations support. - (U) Completed Milstar I Phase II IOT&E. - (U) Implemented Engineering Change Proposals (ECP) as needed based on operational requirements. - (U) Continued MCS modifications to enhance mission control operations. - (U) Transitioned to MCS organic support for software sustainment, mission planning, and satellite operations. - (U) Develop and field operator training equipment. - (U) \$543,621 Milstar II - (U) Completed Satellite 4 MDR payload manufacturing and started MDR integration and test. - (U) Completed Satellite 4 bus component manufacturing. - (U) Continued Satellite 4 LDR integration and test. - (U) Continued Satellites 5 and 6 LDR unit build, MDR payload manufacturing, and bus component manufacturing. - (U) Completed Satellite 3M MDR payload integration and test. - (U) Started Satellite 3M integration and test. - (U) Continued Milstar II MCS software upgrade for mission planning. - (U) \$70,811 Milstar I/II System Engineering - (U) Continued LDR and MDR technical support. - (U) Continued Milstar component integration support. - (U) Continued Milstar software support. - (U) \$31,150 Basic Program Office support - (U) \$659,656 Total		
Project 5010	Page 2 of 9 Pages	Exhibit R-2 (PE 0604479F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604479F Milstar LDR/MDR Sat Comm (Space)	5010
<p>(U) <u>FY 1998</u></p> <ul style="list-style-type: none"> - (U) \$495,388 Milstar I/II - (U) Complete Satellite 3M integration and test. - (U) Complete Satellite 4 LDR and MDR payload integration and test, and start satellite integration and test. - (U) Complete Satellite 5 LDR and MDR payload and bus component manufacturing. - (U) Start Satellite 5 LDR and MDR payload integration and test. - (U) Continue Satellite 6 LDR and MDR payload and bus manufacturing. - (U) Implement ECPs as needed based on operational requirements. - (U) Continue Milstar II MCS software upgrade for mission planning. - (U) Develop and field operator training equipment. - (U) \$76,706 Milstar I/II System Engineering - (U) Satellite 3 technical launch support. - (U) Continue LDR and MDR technical support. - (U) Continue Milstar component integration support. - (U) Continue Milstar software support. - (U) \$26,815 Mission Support - (U) Continue Satellites 1 and 2 on-orbit operations support. - (U) \$29,118 Basic Program Office support. - (U) \$628,027 Total 		
Project 5010	Page 3 of 9 Pages	Exhibit R-2 (PE 0604479F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		PROJECT
5 - Engineering and Manufacturing Development	0604479F Milstar LDR/MDR Sat Comm (Space)	February 1998 5010
<p>(U) <u>FY 1999</u></p> <ul style="list-style-type: none"> - (U) \$463,479 Milstar II - (U) Satellite 3M launch, perform on-orbit checkout, and begin on-orbit testing. - (U) Complete Satellite 4 integration, test, and deliver. - (U) Complete Satellite 5 LDR and MDR payload integration and test, and start satellite integration and test. - (U) Continue Satellite 6 LDR and MDR payload and bus manufacturing. - (U) Continue Milstar II MCS software upgrade for mission planning. - (U) Implement ECPs as needed based on operational requirements. - (U) \$30,770 Milstar I/II System Engineering - (U) Satellites 3 and 4 technical launch support. - (U) Continue LDR and MDR technical support. - (U) Continue Milstar component integration support. - (U) Continue Milstar software support. - (U) \$29,852 Mission Support - (U) Continue Satellites 1, 2, and 3 on-orbit operations support. - (U) \$26,839 Basic Program Office support. - (U) \$550,940 Total 		
Project 5010	Page 4 of 9 Pages	Exhibit R-2 (PE 0604479F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998							
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604479F Milstar LDR/MDR Sat Comm (Space)	PROJECT 5010							
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>					
(U) Previous President's Budget (FY 1998 PB)	683,685	676,690	555,050	9,574,841					
(U) Appropriated Value	720,278	676,690							
(U) Adjustments to Appropriated Value									
a. Congressional General Reductions	-16,413	-27,829							
b. SBIR	-20,180	-20,834							
c. Omnibus Reprogramming	-15,000								
d. Below Threshold Reprogramming (BTR)	-7,900								
e. Rescissions	-1,129								
(U) Adjustments to Budget Years Since FY 1998 PB			-4,110						
(U) Current Budget Submit/FY 1999 President's Budget	659,656*	628,027	550,940	9,689,312					
* Does not reflect three BTRs that total -\$1,911.									
(U) Change Summary Explanation:									
<u>Funding:</u> FY97 BTR actions include -\$400k for Joint Program Office Deskbook (65808F), -\$1M for Modified Miniature Receive Terminals (33110F), -\$500k for DMSP (35160F), -\$3M for the Space Test Program (63402F), -\$3M for the SPACETRACK program (35910F). FY99 adjustment funded higher priority AF and DoD requirements.									
<u>Schedule:</u> None.									
<u>Technical:</u> None.									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Comp</u>	<u>Total</u>
(U) Milstar AF Command Post Terminals, BA 63, P-67*	4,653	2,612	4,816	8,429	2,403	433	428	Cont	TBD
* PE 33601F (Other Procurement) funds Milstar AF-developed ground and airborne Command Post Terminals. PE 33601F also funds various AF MILSATCOM terminals.									
Project 5010			Page 5 of 9 Pages			Exhibit R-2 (PE 0604479F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																																																																																																																										
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604479F Milstar LDR/MDR Sat Comm (Space)	PROJECT 5010																																																																																																																																																										
<p>(U) <u>Related RDT&E:</u> (U) PE 0303601F, MILSATCOM Terminals (U) PE 0603430F, Advanced MILSATCOM (U) PE 0604577N, EHF Satellite Communications (U) PE 0603432F, Polar Satellite Communications Program (Polar Adjunct)</p> <p>(U) D. <u>Schedule Profile</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;"></th> <th colspan="3" style="text-align: center;"><u>FY 1997</u></th> <th colspan="3" style="text-align: center;"><u>FY 1998</u></th> <th colspan="3" style="text-align: center;"><u>FY 1999</u></th> </tr> <tr> <th></th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> </tr> </thead> <tbody> <tr> <td>(U) Milstar I (LDR Only)</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td> (U) IOC I</td> <td></td><td></td><td></td><td style="text-align: center;">x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td> (U) Complete LDR IOT&E, Phase II</td> <td></td><td style="text-align: center;">x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>(U) Milstar II (LDR/MDR)</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td> (U) Satellite 3M Launch</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td style="text-align: center;">x</td><td></td><td></td><td></td> </tr> <tr> <td> (U) Satellite 4 Launch - 2QFY00</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td> (U) MDR IOT&E - 2QFY00</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td> (U) IOC II - 1QFY01</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td> (U) Satellite 5 Launch - 1QFY01</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td> (U) Satellite 6 Launch - 1QFY02</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td> (U) FOC - 1QFY05</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </tbody> </table>				<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				1	2	3	1	2	3	4	1	2	3	4	(U) Milstar I (LDR Only)												(U) IOC I				x								(U) Complete LDR IOT&E, Phase II		x										(U) Milstar II (LDR/MDR)												(U) Satellite 3M Launch								x				(U) Satellite 4 Launch - 2QFY00												(U) MDR IOT&E - 2QFY00												(U) IOC II - 1QFY01												(U) Satellite 5 Launch - 1QFY01												(U) Satellite 6 Launch - 1QFY02												(U) FOC - 1QFY05											
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Project 5010	Page 6 of 9 Pages	Exhibit R-2 (PE 0604479F)																																																																																																																																																										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604479F Milstar LDR/MDR Sat Comm (Space)			PROJECT 5010		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Satellites 1/2/3L				14,074	0	0			
(U)	Satellite 3M				90,848	80,587	69,356			
(U)	Satellite 4				198,676	164,343	155,666			
(U)	Satellite 5				147,361	131,100	118,368			
(U)	Satellite 6				106,736	119,358	120,089			
(U)	Milstar I/II System Engineering				70,811	76,706	30,770			
(U)	Mission Support				0	26,815	29,852			
(U)	Basic Program Office support				31,150	29,118	26,839			
(U)	Total				659,656	628,027	550,940			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
LMSC (Milstar I) [Sats 1,2,3L]	C/CPAF	Jun 83	2,181,587*	2,181,587*	4,727,752	14,074	0	0	0	4,741,826
LMSC (Milstar II) [Sats 3M, 4, 5, 6]	SS/CPAF	Oct 92/ Nov 94	3,355,600	3,355,600	1,668,224	543,621	495,388	463,479	408,749	3,579,461
LMSC (Mission Support)	CPAF	Sep 97	56,667	56,667	0	0	26,815	29,852	0	56,667
Mission Support	TBD	TBD	TBD	TBD	0	0	0	0	300,000	300,000
LINCOM	SS/CPAF	Various			18,692	3,743	3,369	1,000	3,000	29,804
Lincoln Lab	SS/MIPR	Various			20,489	4,203	4,000	3,800	3,800	36,292
Miscellaneous	Various	Various			262,545	62,865	69,337	25,970	95,185	515,902
Project 5010					Page 7 of 9 Pages	Exhibit R-3 (PE 0604479F)				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604479F Milstar LDR/MDR Sat Comm (Space)				PROJECT 5010	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
Aerospace	SS/CPFF/AF	Various			112,770	13,930	14,101	13,296	95,703	249,800
Ogden	SS/MIPR	Various			8,565	1,704	1,659	1,808	14,243	27,979
ANSER	CPFF	Feb 91			4,649	966	2,193	2,300	0	10,108
Miscellaneous	Various	Various			92,508	14,550	11,165	9,435	13,815	141,473
<u>Test and Evaluation Organizations</u>										
None.										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE					PROJECT
5 - Engineering and Manufacturing Development	0604479F Milstar LDR/MDR Sat Comm (Space)					5010
Government Furnished Property:						
<u>Product Development Property</u> None.						
<u>Support and Management Property</u> None.						
<u>Test and Evaluation Property</u> None.						
Subtotal Product Development	6,697,702	628,506	598,909	524,101	810,734	9,259,952
Subtotal Support and Management	218,492	31,150	29,118	26,839	123,761	429,360
Subtotal Test and Evaluation	0	0	0	0	0	0
Total Project	6,916,194	659,656	628,027	550,940	934,495	9,689,312
<p>Note: Due to the overrun on the Milstar I contract, an Over Target Baseline (OTB) was established in Jan 91 to provide a credible cost performance baseline for the remaining contractual effort. The EAC reflects the unclassified cost of remaining work scheduled after the Jan 91 rebaseline. The total program value includes all unclassified prior funding (approx \$4 Billion in FY82 - 92), all unclassified fees & incentives, and ECPs not yet definitized.</p>						
Project 5010	Page 9 of 9 Pages					Exhibit R-3 (PE 0604479F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604480F Global Positioning System Block IIF (Space)				PROJECT 0005	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0005 NAVSTAR GPS BLOCK IIF	36,426	66,918	62,591	26,677	23,099	16,892	14,244	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification**

Activities include satellite design and development; control system, training simulator, and Mission Operation Support Center development and test; satellite upgrade design and development; control system, simulator and support center software upgrades; and R&D efforts to support NAVSTAR Global Positioning System (GPS) Block IIF deployment. This PE is in Budget Activity 5 - Engineering and Manufacturing Development (EMD), and supports research and development of GPS Space and Control systems within the Block IIF Sustainment Program.

Acquisition Strategy: Single satellite development/production contract was competitively awarded in April 1996.

(U) FY 1997 (\$ in Thousands):

- (U) \$31,652 Continued Block IIF - System Sustainment Satellite System Development
- (U) \$2,699 Continued Block IIF - System Sustainment Ground System Development
- (U) \$498 Studies
- (U) \$305 Mission Support
- (U) \$172 Launch Support
- (U) \$1,100 GPS Modernization
- (U) \$36,426 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$54,737 Continue Block IIF - System Sustainment Satellite System Development
- (U) \$12,081 Continue Block IIF - System Sustainment Ground System/Simulator Development
- (U) \$100 Launch Support
- (U) \$66,918 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604480F Global Positioning System Block IIF (Space)	PROJECT 0005																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$34,461 Continue Block IIF - System Sustainment Satellite System Development - (U) \$27,540 Continue Block IIF - System Sustainment Ground System/Simulator Development - (U) \$590 Launch Support - (U) \$62,591 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998 PB)</td> <td style="text-align: right;">35,406</td> <td style="text-align: right;">71,094</td> <td style="text-align: right;">67,853</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">37,142</td> <td style="text-align: right;">71,094</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Gen Reductions</td> <td style="text-align: right;">-778</td> <td style="text-align: right;">-2,354</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-958</td> <td style="text-align: right;">-1,822</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: right;">1,100</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescission</td> <td style="text-align: right;">-80</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-5,262</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY1999 President's Budget</td> <td style="text-align: right;">36,426</td> <td style="text-align: right;">66,918</td> <td style="text-align: right;">62,591</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: FY97 Below Threshold Reprogramming funds GPS Modernization (\$1,100); rescission for Bosnia contingency (-\$80). FY99 adjustments due to non-pay inflation (-\$1,262); Realignment to PE 0305165F, Missile Procurement, to properly fund program activities (-4,000). Schedule: No Change Technical: No Change</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY1998 PB)	35,406	71,094	67,853	Continuing	(U) Appropriated Value	37,142	71,094			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions	-778	-2,354			b. SBIR	-958	-1,822			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	1,100				e. Rescission	-80				(U) Adjustments to Budget Years Since FY1998 PB			-5,262		(U) Current Budget Submit/FY1999 President's Budget	36,426	66,918	62,591	Continuing
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Project 0005	Page 2 of 5 Pages	Exhibit R-2 (PE 0604480F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604480F Global Positioning System Block IIF (Space)				PROJECT 0005	
(U) C. Other Program Funding Summary (\$ in Thousands)									
(U) PE 0305165F, NAVSTAR GPS (Space and Control fund for Block IIA/IIR/IIF, JPO Support, and Control Segment	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) Operations and Maintenance, (PE 0305165F, BA 1 - Operating Forces)	19,972	20,714	25,540	22,650	26,364	26,606	27,452	Cont	Cont
(U) Missile Procurement, (PE 0305165F, BA 5 - Space and Other Support, P-20, 21)	196,965	157,630	174,795	226,822	192,897	134,803	136,487	Cont	Cont
(U) Other Procurement, (PE 0305165F, BP 83 - Electronics and Telecommunications Equipment, WSC 6790, P-68)	10,663	10,060	8,430	1,464	665	795	861	Cont	Cont
<u>Related RDT&E:</u>									
(U) PE 0305164F, NAVSTAR GPS User Equipment									
(U) PE 0101221N, Fleet Ballistic Missile System									
(U) PE 0301357F and 0305913FNuclear Detonation Detection System (NDS)									
(U) PE 0305119F Space Boosters (Delta II)									
(U) PE 0305130F, Consolidated Space Operations Center (CSOC)									
(U) PE 0305165F, NAVSTAR GPS Space/Control									
(U) D. Schedule Profile									
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>			
	1	2 3	4	1 2 3	4	1 2 3	4		
(U) Satellite Preliminary Design complete		x							
(U) Satellite Final Design complete				x					
(U) Advanced Integration complete			x						
Project 0005									
Page 3 of 5 Pages									
Exhibit R-2 (PE 0604480F)									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY					PE NUMBER AND TITLE			PROJECT		
5 - Engineering and Manufacturing Development					0604480F Global Positioning System Block IIF (Space)			0005		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Satellite Preliminary Design Complete					12,173	0	0			
(U) Satellite Final Design Complete					8,182	25,547	0			
(U) Satellite Development Complete					11,297	29,190	34,461			
(U) Ground/Control System Development					2,699	12,081	27,540			
(U) Advanced Integration/Other Studies					498	0	0			
(U) Mission Support					305	0	0			
(U) GPS Modernization					1,100	0	0			
(U) Launch Support					172	100	590			
(U) Total					36,426	66,918	62,591			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Block IIF Development, Boeing North America, Seal Beach, CA	FPAF/CPAF	Apr 96	Cont	Cont	17,680	34,599	66,818	62,001	Cont	Cont
<u>Support and Management Organizations</u>										
Multiple	Various	Various	N/A	N/A	850	1,827	100	590	Cont	Cont
<u>Test and Evaluation Organizations</u>										
N/A										
Project 0005					Page 4 of 5 Pages			Exhibit R-3 (PE 0604480F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604480F Global Positioning System Block IIF (Space)			PROJECT 0005			
Contractor or Government Performing <u>Activity</u> <u>Government Furnished Property:</u> N/A	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
					17,680	34,599	66,818	62,001	Cont	Cont
Subtotal Product Development					850	1,827	100	590	Cont	Cont
Subtotal Support and Management					0	0	0	0	0	0
Subtotal Test and Evaluation										
Total Project					18,530	36,426	66,918	62,591	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604600F Munitions Dispenser Development				PROJECT 1015		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1015	Wind Corrected Munitions Dispenser (WCMD) Kit	46,142	17,519	7,559	0	0	0	0	0	144,720
	Quantity of RDT&E Articles	184/\$9174	6/\$268	0	0	0	0	0	0	204/\$11584

(U) **A. Mission Description and Budget Item Justification**
 This project develops an inertially guided tail kit for CBU-87B, CBU-89B, and CBU-97B dispensers to provide corrections for the effects of wind transients and ballistic errors caused by wind when these munitions are released from medium to high altitudes. Wind Corrected Munitions Dispenser (WCMD) kit fitted weapons will improve effectiveness of both bombers and fighters and significantly contribute to Air Force war fighting capabilities. WCMD kit fitted CBU-97's dropped from bombers are key to stopping enemy armored forces. This is funded in BA 5, Engineering and Manufacturing Development because it develops a weapon system.

(U) **Acquisition Strategy:**
 A full and open competition in FY 1995 led to dual awards for a competitive development effort that included a competitive fly-off. The downselect to one contractor occurred in Jan 1997. The Cost-Plus Award Fee (CPAF) Pilot Production contract awarded to Lockheed-Martin includes production options for five years of production on a Firm-Fixed Price (FFP) basis.

(U) **FY 1997 (\$ in Thousands):**

- (U) 25,184 Completed competitive EMD contract. Start contract for pilot production of Wind Corrected Munitions Dispenser (WCMD) tail kits. Start Non-1760 development study
- (U) 5,465 Completed fly-off with two contractors. Conduct combined F-16 and B-52 DT&E/IOT&E
- (U) 2,899 Program management support; includes travel, program office supplies and equipment, training, and technical engineering support
- (U) 22 Provided other government support, GFE (B-52 & F-16 Data Transfer Cartridge)
- (U) 11,828 Continued aircraft integration on F-16, B-52, and F-15E
- (U) 744 Continued development of Common Munition BIT (Built-in-Test) Reprogramming Equipment (CMBRE)
- (U) \$46,142 Total

(U) **FY 1998 (\$ in Thousands):**

- (U) 11,279 Continue pilot production contract. Complete Non-1760 development study
- (U) 2,134 Continue combined DT&E/IOT&E flight tests.
- (U) 2,356 Program management support; includes travel, program office supplies and equipment, training, and technical engineering support
- (U) 1,750 Complete integration on B-52 and continue integration on F-16
- (U) \$17,519 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604600F Munitions Dispenser Development	PROJECT 1015
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(U) **FY 1999 (\$ in Thousands):**

- (U) 1,200 Complete DT/OT testing
- (U) 1,559 Program management support; includes travel, program office supplies and equipment, training, and technical engineering support
- (U) 4,800 Complete integration on F-16
- (U) \$7,559 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY1998</u>	<u>FY1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	53,631	18,076	7,711	155,741
(U) Appropriated Value	56,229	19,676		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-1,193	-779		
b. SBIR	-1,405	-1,378		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-3,900			
e. Rescissions	-3,589			
(U) Adjustments to Budget Years Since FY 1998 PB			-152	
(U) Current Budget Submit/FY 1999 President's Budget	46,142	17,519	7,559	144,720

(U) Change Summary Explanation:

Funding: Congressional rescission in FY 97 for Bosnia of \$3,589, and \$3,900 reprogrammed to meet higher Air Force priorities. The funds were available due to 3 month stop-work order resulting from a contractor protest. Congress added \$1,600 in FY 98 to cover the FY 97 effort slipped into FY 98 as a result of the protest. In FY 98, \$417 is pending reprogramming to fund higher priorities and additional \$8 for SBIR. FY 99 reduction of \$152 due to inflation adjustment.

Schedule: A stop work order for 3 months (Feb 97-Apr 97) due to a contractor protest delayed the start of DT&E/IOT&E from May 97 to Sep 97. Consequently, the LRIP decision/award slips from 2 Qtr FY 98 to 3 Qtr FY 98. However, by LRIP II (Jan 99) the program recovers.

Technical: No changes

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604600F Munitions Dispenser Development				PROJECT 1015				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>												
								To	Total			
								Compl	Cost			
(U) WCMD Kit Production, Proc of Ammo, AF, (Appn 3011); PE 0207600F		FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	145,724	508,361		
		0	7,962	13,862	49,807	101,323	108,904	80,779				
(U) SEEK EAGLE (WCMD), Proc of Ammo, AF (Appn 3011); PE 0207590F		0	4,012	0	0	1,824	0	0	0	5,836		
(U) TOTAL		0	11,974	13,862	49,807	103,147	108,904	80,779	145,724	514,197		
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Engineering Milestones												
Design Reviews (3Q 96)												
Pilot Production									*			
(U) T&E Milestones												
Aircraft Cert Tests (FY 95)												
Contractor Dev Testing (1Q 96)												
Competitive Fly-Off									*			
(U) Contract Milestones												
EMD Contract Award (FY 95)												
Downselect									*			
(U) Other Program Events												
DT/OT				*						X		
LRIP Decision							X					
LRIP Award 1/Award 2						X			X			
Milestone III											X	
FRP 1 Award (FY 00/Q2)												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604600F Munitions Dispenser Development				PROJECT 1015	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Major Contracts					25,184	11,279	0			
(U) Support Contracts					1,865	1,582	480			
(U) Program Office Support					1,034	774	1,079			
(U) Test And Evaluation					5,465	2,134	1,200			
(U) Aircraft Integration					11,828	1,750	4,800			
(U) Government Furnished Equipment (GFE)					22	0	0			
(U) CMBRE					744	0	0			
(U) Total					46,142	17,519	7,559			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
WCMD Development Contractors	CPAF Lockheed Martin	Jan 98	77,023	77,023	40,560	25,184	11,279	0	0	77,023
<u>Support and Management Organizations</u>										
ASC/YH	N/A	varius	N/A	N/A	3,164	1,034	774	1,079	0	6,051
Sverdrup	CPAF	Oct 97	N/A	N/A	2,042	906	972	0	0	3,920
Miscellaneous	CPAF	varius	N/A	N/A	1,536	959	610	480	0	3,585
Project 1015										
Page 4 of 5 Pages										
Exhibit R-3 (PE 0604600F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604600F Munitions Dispenser Development				PROJECT 1015	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Test and Evaluation Organizations</u>										
46 OG/OGML	REO	Oct 98	N/A	N/A	1,927	5,465	2,134	1,200	0	10,726
Acft Integration	AF 616	Oct 98	N/A	N/A	16,165	11,828	1,750	4,800	0	34,543
Government Furnished Property:										
<u>Product Development Property</u>										
SFW/CEM/SE	FPIF	Apr 96	N/A	N/A	4,479	22	0	0	0	4,501
CMBRE	CPAF	Jul 97	N/A	N/A	3,627	744	0	0	0	4,371
<u>Support and Management Property:</u> None										
<u>Test and Evaluation Property:</u> None										
Subtotal Product Development				85,895	48,666	25,950	11,279	0	0	85,895
Subtotal Support and Management				13,556	6,742	2,899	2,356	1,559	0	13,556
Subtotal Test and Evaluation				45,269	18,092	17,293	3,884	6,000	0	45,269
TOTAL				144,720	73,500	46,142	17,519	7,559	0	144,720

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604602F Armament Ordnance Development
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	3,477	1,511	12,037	1,342	1,363	1,395	1,431	Continuing	Continuing
4696 Armament Standardization/Control/Munitions Material Handling Equipment (MMHE)*	0	0	1,178	1,205	1,229	1,259	1,292	Continuing	Continuing
3133 Bombs & Fuzes	3,348	1,383	10,727	0	0	0	0	Continuing	Continuing
5613 Containers	129	128	132	137	134	136	139	Continuing	Continuing
Quantity of RDT&E Articles	609/\$2852	0	0	0	0	0	0	0	747\$3658**

* MMHE is funded in Seek Eagle, PE 27590F, for FY97 and FY98

** Joint Programmable Fuze (JPF) RDT&E Articles only

(U) A. Mission Description and Budget Item Justification

The Armament Ordnance Development program provides for initial and continuing development of munition equipment for support and operational use.

Armament Standardization/Control/Munitions Material Handling Equipment (MMHE): This continuing project develops and improves the standardization and commonality of munitions handling and armament equipment to preclude duplication. This project's efforts are limited to the study, design, and development, of MMHE and armament control systems. Procurement will be performed and funded by the applicable weapons system project. (Funding for Project 4696 in FY97 and FY98 is through PE 27590F, Seek Eagle.)

Bombs and Fuzes: This project develops and improves conventional bombs and fuzes. It currently includes the development of the Joint Programmable Fuze (JPF) and the Hard Target Smart Fuze (HTSF). Small Bomb System (SBS) begins the Concept Exploration phase in this project. The initial Small Bomb System program funding will be used to explore concepts to meet CAF MNS 304-97 for the Miniaturized Munitions Capability.

Containers: This project funds the operation of the tri-service Container Design Retrieval System (CDRS). This maintains a container database to preclude proliferation and duplication of munitions containers. It also supports organic container design, prototyping, and testing capabilities.

This Armament Ordnance Development program is funded in budget activity 5 - Engineering and Manufacturing Development because the projects support the EMD phase of several munitions related items and functions.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604602F Armament Ordnance Development					
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget	3,483	1,597	135	Continuing					
(U) Appropriated Value	3,642	1,597							
(U) Adjustments to Appropriated Value									
a. Cong Gen Reductions	-90	-56							
b. SBIR	-69	-30							
c. Omnibus or Other Above Threshold Reprogram									
d. Below Threshold Reprogramming									
e. Rescissions	-6								
(U) Adjustments to Budget Years Since FY 1998 PB			11,902						
(U) Current Budget Submit/FY 1999 President's Budget	3,477	1,511	12,037	Continuing					
(U) Change Summary Explanation:									
Funding: FY 1999 changes were due to transferring the MMHE Project from Seek Eagle, funding Hard Target Smart Fuze development, and funding Small Bomb System pre-Milestone I risk reduction and Analysis of Alternatives.									
Schedule: N/A									
Technical: N/A									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Appropriation: Ammunition Procurement, Air Force, PE: 0208030F, Program Title:									
(U) Joint Programmable Fuze	4,125	5,739	15,326	9,864	11,330	13,552	42,911	116,546	219,393
(U) Hard Target Smart Fuze	0	0	0	7,706	7,763	0	0	0	15,469
(U) Appropriation: RDT&E, Air Force, PE: 0208030F, War Readiness Materials (HTSF),	670	0	0	0	0	0	0	0	670

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604602F Armament Ordnance Development				PROJECT 4696	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4696 Armament Standardization/Control/ Munitions Material Handling Equipment (MMHE)*	0	0	1,178	1,205	1,229	1,259	1,292	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p><u>Armament Standardization/Control/Munitions Material Handling Equipment (MMHE)</u>: This continuing project develops and improves the standardization and commonality of improved munitions handling and armament equipment to preclude duplication and proliferation. This project's efforts are limited to the study, design, and development, of MMHE and armament control systems. Procurement will be performed and funded by the applicable weapons system project. (Funding for Project 4696 in FY97 and FY98 is through PE 27590F, Seek Eagle.)</p> <p>(U) <u>FY 1997 (\$ in Thousands)</u>:</p> <ul style="list-style-type: none"> - (U) \$ 0 Project funded in PE 27590F, Seek Eagle. <p>(U) <u>FY 1998 (\$ in Thousands)</u>:</p> <ul style="list-style-type: none"> - (U) \$ 0 Project funded in PE 27590F, Seek Eagle. <p>(U) <u>FY 1999 (\$ in Thousands)</u>:</p> <ul style="list-style-type: none"> - (U) \$ 498 Design, prototype and test various MMHE projects, i.e. complete testing of GBU Wing Container, International Storage Organization (ISO) Container Handling Device, T-2 Pallet Lock Device, and Flare Assembly Fixture. Complete prototype/testing of Alternate Mission Equipment (AME) Maintenance Stand. - (U) \$ 480 Initiate EMD for Next Generation Munitions Handler, complete evaluation/testing and MHU-110 Trailer Upgrade and Aluminum Rail Set - (U) \$ 100 Complete preliminary design of Next Generation Munitions Trailer and B-52 ALCM Pylon Loading Adapter - (U) \$ 100 Continue ISO Container Munitions Packaging and Bottom Lift Forklift Projects - (U) \$1,178 Total 									
Project 4696			Page 3 of 15 Pages				Exhibit R-2 (PE 0604602F)		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604602F Armament Ordnance Development	PROJECT 4696
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997*</u>	<u>FY 1998*</u>	<u>FY 1999</u>
(U) Various MMHE Projects	0	0	498
(U) Next Generation Munitions Handler	0	0	400
(U) MHU-110 Trailer Upgrade	0	0	50
(U) Aluminum Rail Set	0	0	30
(U) Next Generation Munitions Trailer	0	0	75
(U) ISO Container Handling	0	0	100
(U) ALCM Pylon Adapter	0	0	25
(U) Total	0	0	1,178

* Funded in Seek Eagle, PE 27590F

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604602F Armament Ordnance Development				PROJECT 4696	
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Dept. of Energy/ NASA	MIPR	Oct 98	N/A	N/A	0	0	0	400	Continuing	Continuing
<u>Support and Management Organizations</u>										
TEAS/TAMS	MIPR	Oct 98	N/A	N/A	0	0	0	426	Continuing	Continuing
AFDTC/FM	MIPR	Oct 98	N/A	N/A	0	0	0	160	Continuing	Continuing
64SSUPS/LGS	MIPR	Cont.	N/A	N/A	0	0	0	30	Continuing	Continuing
WL/MN	MIPR	Cont.	N/A	N/A	0	0	0	50	Continuing	Continuing
<u>Test and Evaluation Organizations</u>										
46 th Test Wing	MIPR	Cont.	N/A	N/A	0	0	0	112	Continuing	Continuing
Government Furnished Property: Not Applicable.										
Subtotal Product Development					0	0	0	400	Continuing	Continuing
Subtotal Support and Management					0	0	0	666	Continuing	Continuing
Subtotal Test and Evaluation					0	0	0	112	Continuing	Continuing
Total Project					0	0	0	1178	Continuing	Continuing
Project 4696					Page 6 of 15 Pages			Exhibit R-3 (PE 0604602F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604602F Armament Ordnance Development				PROJECT 3133				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3133	Bombs & Fuzes			3,348	1,383	10,727	0	0	0	0	Continuing	Continuing
Quantity of RDT&E Articles				609(\$2852)*	0	0	0	0	0	0	0	747(\$3658)*
* JPF RDT&E Articles only												
(U) A. <u>Mission Description and Budget Item Justification</u>												
<u>Bombs and Fuzes:</u> This project develops and improves conventional bombs and fuzes including the development of the Joint Programmable Fuze (JPF) and the Hard Target Smart Fuze (HTSF). Small Bomb System (SBS) begins the Concept Exploration phase in this project.												
(U) <u>FY 1997 (\$ in Thousands):</u>												
- (U) \$ 1,667 Started JPF IOT&E												
- (U) \$ 158 Started JPF/JDAM Integration Flight Test												
- (U) \$ 1,523 Started Hard Target Smart Fuze (HTSF) EMD												
- (U) \$ 3,348 Total												
(U) <u>FY 1998 (\$ in Thousands):</u>												
- (U) \$ 201 Complete JPF IOT&E Test												
- (U) \$ 922 Complete JPF/JDAM Integration Flight Test												
- (U) \$ 260 Complete JPF Functional Configuration Audit, Production Readiness Review, and Physical Configuration Audit												
- (U) \$ 1,383 Total												
(U) <u>FY 1999 (\$ in Thousands):</u>												
- (U) \$ 1,050 HTSF System Requirements Review (SRR)												
- (U) \$ 2,534 HTSF Preliminary Design Review (PDR)												
- (U) \$ 2,243 Start Detailed Design												
- (U) \$ 1,000 Small Bomb System Concept Exploration Contracts												
- (U) \$ 250 Small Bomb System Program Office Support												
- (U) \$ 3,650 Small Bomb System Analysis of Alternatives (AoA)												
- (U) \$10,727 Total												

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY				PE NUMBER AND TITLE			PROJECT			
5 - Engineering and Manufacturing Development				0604602F Armament Ordnance Development			3133			
(U) B. Program Change Summary (\$ in Thousands)										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total Cost</u>				
(U) Previous President's Budget		3,354	1,461	0		Continuing				
(U) Appropriated Value		3,509	1,461							
(U) Adjustments to Appropriated Value										
a. Cong Gen Reductions		-86	-51							
b. SBIR		-69	-27							
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming										
e. Rescissions		-6								
(U) Adjustments to Budget Years Since FY 1998 PB				10,727						
(U) Current Budget Submit/FY 1999 President's Budget		3,348	1,383	10,727		Continuing				
(U) Change Summary Explanation:	Funding: FY97 reductions were for SBIR, General Congressional Reductions, and support for Bosnia operations. FY98 reductions were for SBIR, and General Congressional Reductions. FY 1999 changes were due to funding Hard Target Smart Fuze and funding Small Bomb System pre-Milestone I risk reduction and Analysis of Alternatives. Schedule: N/A Technical: N/A									
(U) C. Other Program Funding Summary (\$ in Thousands)										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Appropriation: Ammunition Procurement, Air Force, PE: 0208030F, Program Title:										
(U) Joint Programmable Fuze	4,125	5,739	15,326	9,864	11,330	13,552	42,911	116,546	219,393	
(U) Hard Target Smart Fuze	0	0	0	7,706	7,763	0	0	0	15,469	
(U) Appropriation: RDT&E, Air Force, PE: 0208030F War Readiness Materials (HTSF)	670	0	0	0	0	0	0	0	670	
(U) D. Schedule Profile										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604602F Armament Ordnance Development						PROJECT 3133	
<u>FY 1997</u>					<u>FY 1998</u>				<u>FY 1999</u>			
1	2	3	4	1	2	3	4	1	2	3	4	
(U) <u>Joint Programmable Fuze (JPF)</u>												
(U) Complete DT&E		X										
(U) Start IOT&E		X										
(U) Complete IOT&E								X				
(U) <u>Hard Target Smart Fuze (HTSF)</u>												
(U) EMD Start						X						
(U) System Requirement Review (SRR)								X				
(U) Preliminary Design Review (PDR)										X		
(U) Start Detailed Design										X		
(U) <u>Small Bomb System (SBS)</u>												
(U) Start Concept Exploration/AoA								X				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	
BUDGET ACTIVITY		PE NUMBER AND TITLE	
5 - Engineering and Manufacturing Development		0604602F Armament Ordnance Development	
		PROJECT	
		3133	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) a. Contractor	2,893	1019	5,805
(U) b. Government			
Testing	18	97	2,993
Contractor support	174	112	595
Management support	263	128	684
ECO	0	27	650
Government Total	455	364	4,922
(U) Total	3,348	1,383	10,727

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604602F Armament Ordnance Development				PROJECT 3133	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Motorola (JPF Only)	CPAF	Jul 93	21,357	21,357	18,819	1,519	1019	0	0	21,357
Unknown (HTSF and SBS)	TBD	Jan 98	TBD	7,179	0	1,374	0	5,805	Continuing	Continuing
<u>Support and Management Organizations</u>										
TEAS/TEAMS	Various	Various	N/A	N/A	959	174	112	595	Continuing	Continuing
ASC/WMG	Various	Various	N/A	N/A	597	263	128	684	Continuing	Continuing
Other	Various	Various	N/A	N/A	250	0	27	650	Continuing	Continuing
<u>Test and Evaluation Organizations</u>										
46th Test Wing	Various	Mar 94	N/A	N/A	3,212	18	97	2,993	Continuing	Continuing
Government Furnished Property: Not Applicable										
Subtotal Product Development					18,819	2,893	1019	5,805	Continuing	Continuing
Subtotal Support and Management					1,806	437	267	1,929	Continuing	Continuing
Subtotal Test and Evaluation					3,212	18	97	2,993	Continuing	Continuing
Total Project					23,837	3,348	1,383	10,727	Continuing	Continuing
Project 3133					Page 11 of 15 Pages			Exhibit R-3 (PE 0604602F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604602F Armament Ordnance Development				PROJECT 5613	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
5613 Containers	129	128	132	137	134	136	139	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p><u>Containers:</u> This project funds the operation of the tri-service Container Design Retrieval System (CDRS). This system includes the maintenance of a container database to preclude proliferation and duplication of munitions containers. It also supports organic container design, prototyping, and testing capabilities. This project's efforts are limited to the study, design, and development of container systems. Any procurement will be performed and funded by the applicable weapons system project.</p> <p>(U) FY 1997 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$5 Initiated/continued/completed design/development of various CDRS projects, including a modular mobility container system, and special projects. - (U) \$5 Provided container design expertise, management, and technical support to programs such as AIM-9X, JASSM, AMRAAM, AGM-142, JDAM, AGM-130, and WCMD. - (U) \$119 Managed and operated the CDRS data base and support service. - (U) \$129 Total <p>(U) FY 1998 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$5 Initiate/continue/complete design/development of various CDRS projects, including a modular mobility container system, and special projects. - (U) \$5 Provide container design expertise, management, and technical support to programs such as AIM-9X, JASSM, AMRAAM, AGM-142, JDAM, AGM-130, and WCMD. - (U) \$118 Manage and operate the CDRS data base and support service. - (U) \$128 Total 									
Project 5613			Page 12 of 15 Pages				Exhibit R-2 (PE 0604602F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604602F Armament Ordnance Development	PROJECT 5613																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5 Initiate/continue/complete design/development of various CDRS projects, including a modular mobility container system, and special projects. - (U) \$5 Provide container design expertise, management, and technical support to programs such as AIM-9X, JASSM, AMRAAM, AGM-142, JDAM, AGM-130, and WCMD. - (U) \$122 Manage and operate the CDRS data base and support service. - (U) \$132 Total 																																																									
<p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget</td> <td style="text-align: center;">129</td> <td style="text-align: center;">136</td> <td style="text-align: center;">135</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">133</td> <td style="text-align: center;">136</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Gen Reductions</td> <td style="text-align: center;">-4</td> <td style="text-align: center;">-5</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td></td> <td style="text-align: center;">-3</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-3</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY99 President's Budget</td> <td style="text-align: center;">129</td> <td style="text-align: center;">128</td> <td style="text-align: center;">132</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget	129	136	135	Continuing	(U) Appropriated Value	133	136			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions	-4	-5			b. SBIR		-3			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB			-3		(U) Current Budget Submit/FY99 President's Budget	129	128	132	Continuing
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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(U) Current Budget Submit/FY99 President's Budget	129	128	132	Continuing																																																					
<p>(U) Change Summary Explanation: Funding: FY98 change due to Congressional General Reductions and SBIR. FY99 change due to inflation. Schedule: Not Applicable Technical: Not Applicable</p>																																																									
<p>(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> Not Applicable</p>																																																									
<p>(U) D. <u>Schedule Profile:</u> Not Applicable</p>																																																									
<p>Project 5613 Page 13 of 15 Pages Exhibit R-2 (PE 0604602F)</p>																																																									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604602F Armament Ordnance Development				PROJECT 5613	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Travel/Transportation					70	70	72			
(U) Supplies/Equipment					49	48	50			
(U) Contractor Support					0	0	0			
(U) Mission Support					10	10	10			
(U) Test Support					0	0	0			
(U) Total					129	128	132			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
N/A										
<u>Support and Management Organizations</u>										
Sverdrup (TEAS)	Various	Oct 93	N/A	N/A	1,455	0	0	0	Continuing	Continuing
ASC/YHS	Various	Various	N/A	N/A	568	10	10	10	Continuing	Continuing
Other	Various	Various	N/A	N/A	451	119	118	122	Continuing	Continuing
<u>Test and Evaluation Organizations</u>										
46th Test Wing	Various	Various	N/A	N/A	190	0	0	0	Continuing	Continuing
Project 5613					Page 14 of 15 Pages			Exhibit R-3 (PE 0604602F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604604F Submunitions				PROJECT 3166		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3166	Joint Smart Munition Test and Evaluation Program	4,761	4,748	4,805	4,886	4,909	4,921	4,867	Continuing	Continuing
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification**
This PE provides support for smart munitions test and evaluation (T&E) activities, including T&E support for programs in engineering and manufacturing development. Project 3166 is a joint US Air Force/US Army project office which provides RDT&E support for developmental smart munitions acquisition programs. Project 3166 evaluates developmental smart munitions and related emerging technology with applications against vehicle targets and Theater Air Defense units by determining performance against actual foreign targets in realistic environments and in the presence of countermeasures. Data gathered is used to meet developmental decision points requiring highly reliable, realistic performance data. The project is a major focal point for joint Air Force and Army target signature collection and dissemination for development and exploitation purposes. Phase IV (FY96-98) emphasized providing best value test and evaluation support for submunition development and weaponization studies, and Phase V (FY99-01) will provide modeling and simulation capabilities to augment a limited number of expensive measurement and open air tests of smart weapons and related technologies. Because this program supports development programs prior to production decision, this project is funded in BA 5 - Engineering and Manufacturing Development.

(U) **Acquisition Strategy:**
Funds are executed organically in support of test and evaluation activities including studies, analyses, flight tests, model building and simulation. There are several small contracts supporting the program office.

(U) **FY 1997 (\$ in Thousands):**

- (U) 1,088 Continued Phase IV of the weapon effectiveness evaluation
- (U) 300 Developed models and simulation tools to support electronic engagement simulations
- (U) 700 Continued maintenance and expansion of vulnerability/lethality and signature databases
- (U) 1,200 Planned and conducted captive carry flight tests and signature collection for seeker/sensor evaluations and algorithm development
- (U) 700 Conducted advanced warhead effectiveness evaluation
- (U) 773 Continued vulnerability analysis of Suppression of Enemy Air Defense (SEAD), and Theater Missile Defense (TMD) targets
- (U) \$4,761 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604604F Submunitions	PROJECT 3166
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(U) FY 1998 (\$ in Thousands):

- (U) 1,200 Complete Phase IV of the weapon effectiveness evaluation
- (U) 458 Develop models and simulation tools to support engagement simulations
- (U) 530 Continue maintenance and expansion of vulnerability/lethality and signature database
- (U) 1,154 Plan and conduct captive carry flight tests and signature collection for seeker/sensor evaluations and algorithm development
- (U) 706 Conduct advanced warhead effectiveness evaluations
- (U) 700 Continue vulnerability analysis of Suppression of Enemy Air Defense (SEAD) and Theater Missile Defense (TMD) targets
- (U) \$4,748 Total

(U) FY 1999 (\$ in Thousands):

- (U) 1,200 Initiate Phase V of the weapon effectiveness evaluation
- (U) 500 Develop and validate improved models and simulation for assessment of alternatives and force on force studies
- (U) 500 Increase utility of lethality/vulnerability and signature database through conversion to migration system and addition of modern threat system data
- (U) 1,300 Plan and conduct captive carry flight tests and signature collection for seeker/sensor evaluations and algorithm development
- (U) 600 Characterize performance of advanced and programmable warheads to access potential for increasing lethality of weapons
- (U) 705 Perform vulnerability analysis of upgraded/advanced Suppression of Enemy Air Defense (SEAD) and Theater Missile Defense (TMD) targets
- (U) \$4,805 Total

(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	4,769	4,956	4,902	Continuing
(U) Appropriated Value	4,873	4,956		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-104	-162		
b. SBIR		-46		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-8			
(U) Adjustments to Budget Years Since FY 1998 PB			-97	
(U) Current Budget Submit/FY 1999 President's Budget	4,761	4,748	4,805	Continuing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604604F Submunitions	3166
<p>(U) Change Summary Explanation:</p> <p>Funding: No Significant Changes</p> <p>Schedule: No change.</p> <p>Technical: No change.</p> <p>(U) C. Other Program Funding Summary (\$ in Thousands): None</p> <p>(U) D. Schedule Profile: Not Applicable as this is a continuing test effort (target/warhead evaluation/analysis, signature tests, captive carry flight tests, are ongoing throughout the year and continue through the FYDP).</p>		
Project 3166	Page 3 of 5 Pages	Exhibit R-2 (PE 0604604F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604604F Submunitions			PROJECT 3166		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Program Support					911	1,146	1,208			
(U) Target Support					685	460	415			
(U) Warhead Range Operations					315	308	327			
(U) Captive Flight Tests					250	584	556			
(U) Database Support (MILES)					440	265	285			
(U) Vulnerability/Effectiveness Analysis					600	622	640			
(U) Warhead Evaluation					460	335	343			
(U) Target Signature Tests					800	570	545			
(U) Models and Simulation Tools					300	458	486			
(U) Total					4,761	4,748	4,805			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
N/A										
<u>Support and Management Organizations</u>										
Sverdrup	CIF	Jun 96	N/A	N/A	6,347	1,478	1,523	1,602	Cont	Cont
ANSTEC	FFP	Apr 96	N/A	N/A	790	245	172	183	Cont	Cont
46 OG/OGML	N/A	Annual	N/A	N/A	4,341	425	443	464	Cont	Cont
<u>Test and Evaluation Organizations</u>										
46 OG/OGML		Annual	N/A	N/A	62,203	2,613	2,610	2,556	Cont	Cont
Project 3166					Page 4 of 5 Pages			Exhibit R-3 (PE 0604604F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604604F Submunitions			PROJECT 3166		
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
Government Furnished Property: None									
Subtotal Product Development				0	0	0	0	Cont	Cont
Subtotal Support and Management				11,478	2,148	2,138	2,249	Cont	Cont
Subtotal Test and Evaluation				62,203	2,613	2,610	2,556	Cont	Cont
TOTAL				73,681	4,761	4,748	4,805	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604617F Air Base Operability	PROJECT 2895
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2895 Air Base Operability	2,776	1,260	2,503	2,563	2,587	0	0	0	153,384
Quantity of RDT&E Articles	2*	0	0	0	0	0	0	0	0

* Two blades in different configurations costing \$171K and \$119K were purchased with FY97 3600 funding for test and evaluation. They will be fielded to provide a minimal capability for emergency ordnance clearance operations.

(U) A. Mission Description and Budget Item Justification

This Program Element provides capabilities to rapidly deploy, and defend and sustain airfield operations and command and control activities, which are prerequisites to establishing air superiority. These systems provide beddown for aircraft, support equipment, and forces at both main operating bases and contingency operating locations, which may have only a runway and a water source. They also offer crucial utilities, runway stabilization and repair, explosive ordnance disposal (EOD), security and reconnaissance capabilities to support aircraft deployment, launch, recovery and regeneration. Lighter-weight, rapidly deployable equipment has become essential in supporting numerous global contingencies such as DESERT SHIELD/DESERT STORM, Provide Comfort, Restore Hope, and Joint Endeavor, for security, base defense, relief efforts, and special operations throughout the world. Air Base Operability (ABO) capabilities being developed include: Joint Service (Army-led) test, evaluation and acquisition of protective vehicles to be used by Air Force explosive ordnance disposal technicians for reconnaissance and mine clearing missions; power generation and distribution systems to reduce airlift; medium shelters; and systems to stabilize soil and extend taxiways and aircraft parking aprons. The Air Base Operability (ABO) program is in RDT&E budget activity 5 - Engineering and Manufacturing Development (EMD) because it supports development, testing and evaluation of materials and equipment for contingency basing, detection and handling of explosive ordnance and tactical shelters.

(U) Acquisition Strategy

Many of the projects funded in the PE employ a streamlined acquisition approach, instead of traditional EMD. Whenever practical, commercial items are tested and evaluated as candidates for solutions to user needs. Instead of EMD, this approach uses a Commercial Item Performance Evaluation (CIPE) phase to determine if off-the-shelf equipment is adequate for military purposes. Initiation of the CIPE phase includes all EMD activities leading up to contract award and subsequent test and evaluation culminating in a Milestone III production decision.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604617F Air Base Operability	PROJECT 2895
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$780 Completed EMD for Rapid Ordnance Removal System (RORS). - (U) \$842 Initiated CIPE for Deployable Power Generation and Distribution System (DPGDS). - (U) \$111 Completed EMD for the UA-HHV - (U) \$1043 Continued other technical support. - (U) \$2,776 TOTAL <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$448 Initiate CIPE for Medium Shelter Systems. - (U) \$542 Continue CIPE for DPGDS. - (U) \$270 Continue other technical support. - (U) \$1,260 TOTAL <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$585 Complete CIPE for Medium Shelter Systems. - (U) \$485 Complete CIPE for DPGDS. - (U) \$780 Initiate CIPE for All-purpose Remote Transport System (ARTS). - (U) \$653 Continue other technical support. - (U) \$2,503 TOTAL 		
Project 2895	Page 2 of 7 Pages	Exhibit R-2 (PE 0604617F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY	PE NUMBER AND TITLE 0604617F Air Base Operability	PROJECT 2895
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	2,781	1,424	2,553	153,741
(U) Appropriated Value	2,926	1,424		
(U) Adjustments to Appropriated Value				
a. Congressional Gen Reductions	-77	-133		
b. SBIR	-68	-31		
c. Omnibus and Other Threshold Reprogrammings				
c. Below Threshold Reprogramming				
d. Rescissions (Bosnia)	-5			
(U) Adjustments to Budget Years Since FY 1998 PB			-50	
(U) Current Budget Submit/FY99 Presidents Budget	2,776	1,260	2,503	153,384

(U) Change Summary Explanation:

Funding: No significant changes.

Schedule: No change.

Technical: No change.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604617F Air Base Operability	PROJECT 2895
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY</u> <u>1997</u>	<u>FY</u> <u>1998</u>	<u>FY</u> <u>1999</u>	<u>FY</u> <u>2000</u>	<u>FY</u> <u>2001</u>	<u>FY</u> <u>2002</u>	<u>FY</u> <u>2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>
(U) Other Procurement, AF, Other Base Maintenance and Support Program:									
Mobility Equipment (0208031F) (WSC 845420)	21,478	24,048	35,973	35,757	37,667	13,179	13,423	Cont	Cont
Air Base Operability (0208028F) (WSC 845100)	2,905	4,118	5,363	4,482	1,884	0	0	0	18,752
HMMWV, Armored (0208028F) (WSC 823200)	3,114	3,037	0	0	0	0	0	0	6,151
HMMWV, Armored (0207588F) (WSC 823200)	4,282	45,856	0	0	0	0	0	0	50,138

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	0604617F Air Base Operability 2895
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
RAPID ORDNANCE REMOVAL SYS												
- Complete Performance Testing/No production planned				*								
MEDIUM SHELTER SYSTEMS												
- Milestone I/II Decision					X							
- CIPE Contract Award								X				
- Complete IOT&E											X	
- Milestone III Decision												X
DEPLOY POWER GEN & DISTRO SYS												
- Initiate CIPE		*										
- Milestone I/II Decision				*								
- Award Phase I Contract							X					
- Award Phase II Contract											X	
UP-ARMORED VEHICLE (UA-HHV)												
- Complete EMD (Upper Armor)					X							
- Production Contract Award (Lower Armor)				*								
- Consign to ALC					X							
ALL-PURPOSE REMOTE TRANSPORT SYSTEM												
- Initiate CIPE for Attachments											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604617F Air Base Operability	PROJECT 2895
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Contracts	430	662	1,050
(U) A&AS Support	632	245	650
(U) Other Government Agencies	661	83	150
(U) Materials/Equipment	10	0	0
(U) Other Technical Support	1,043	270	653
(U) Total	2,776	1,260	2,503

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
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Product Development Organizations

Projects					*					*
RORS-Army	MIPR	May 96	1,569	1,569	735	780	0	0	0	1,515
Medium Shelter	FFP	Aug 98	1,050	1,050	0	0	448	585	0	1,033
Systems Deployable	FFP	May 98	2,238	2,238	0	842	542	485	0	1,869
Power UA-HHV	Mult	Sep 97	2,702	2,702	1,478	111	0	0	0	1,589
ARTS	FFP	TBD	2,800	2,800	0	0	0	780	170	950
Other ABO Projects			4,180	4,180	0	0	0	0	4,180	4,180
Sub-Total					*	1,733	990	1,850	4,350	*

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE	
BUDGET ACTIVITY					PE NUMBER AND TITLE					PROJECT	
5 - Engineering and Manufacturing Development					0604617F Air Base Operability					2895	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to * <u>FY 1997</u>	Budget <u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Budget to Complete	Total Program	
<u>Support and Management Organizations</u>											
Various	Various	Various	N/A	N/A	*	1,043	270	653	800	*	
<u>Test and Evaluation Organizations</u>											
Various	Various	Various	N/A	N/A	*	0	0	0	0	*	
Government Furnished Property:											
Subtotal Product Development					*	1,733	990	1,850	4,350	*	
Subtotal Support and Management					*	1,043	270	653	800	*	
Subtotal Test and Evaluation					*	0	0	0	0	*	
Total Project						141,695	2,776	1,260	2,503	5,150	153,384
* Not traceable to previous allocation among subtotals, however total prior to FY97 is included in overall project line											
Project 2895											
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Exhibit R-3 (PE 0604617F)											

DATE
February 1998

BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
0604617F Air Base Operability

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604618F Joint Direct Attack Munitions	PROJECT 3890
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3890 Joint Direct Attack Munitions	32,932	21,896	12,204	1,410	1,191	1,610	0	0	293,935
Quantity of RDT&E Articles	213/\$5904	296/\$8122*	0	0	0	0	0	0	509/\$14026

* These amounts reflect assets by delivery year and can not be reconciled to the dollar amounts (incremental funding) shown in any one year.

(U) A. Mission Description and Budget Item Justification

Desert Storm confirmed the need for a more accurate weapon delivery capability in adverse weather conditions from medium/high altitudes. Failure to satisfy this requirement will allow the enemy to continue to take advantage of the sanctuary of weather and/or prevent US air power from prosecuting a conflict on its terms. JDAM is an Air Force and Navy munitions program to correct these shortfalls, with the Air Force as the executive service. JDAM will upgrade the existing inventory of general purpose bombs (Mk-84, BLU-109, and Mk-83/BLU-110) by integrating them with a guidance kit consisting of a Global Positioning System aided Inertial Navigation System (INS/GPS). JDAM will provide an accurate (13 meters) adverse weather capability. JDAM threshold aircraft are B-52H, F-22, and F/A-18C/D, and JDAM objective aircraft are B-2, B-1B, F-16, F-15E, and A/V-8B and other aircraft. JDAM development is a two-phased Engineering and Manufacturing Development (EMD) effort. EMD Phase I emphasized competitive design and manufacturing processes. This phase completed 10 Oct 95. EMD Phase II emphasizes full scale hardware build and flight test to verify system performance and will support OT&E. JDAM is an Air Force ACAT ID program. JDAM Low Rate Initial Production (LRIP) began in FY97. This program is funded in Budget Activity 5, EMD, due to its focus on devising an affordable design and manufacturing process.

(U) Acquisition Strategy:

The JDAM contract for Engineering and Manufacturing Development (EMD) Phase II is Cost Plus Award Fee. In addition, there are two Firm Fixed Price contract options for Procurement Lots 1 and 2 (LRIP). Procurement Lots 3, 4, and 5 have a Procurement Price Commitment agreement to ensure a low unit cost.

(U) FY 1997 (\$ in Thousands):

- (U) \$20,325 Continued EMD prime contractor activities to include delivery of Guided Test Vehicles (GTVs) and ground test equipment for combined Developmental and Operational Testing (DT/OT) and began redesign of BLU-109 and MK-83 kits.
- (U) \$ 3,236 Continued Support and Management tasks to define and coordinate the program activities of the prime contractor and various government development and test organizations.
- (U) \$ 9,371 Conducted guided flight tests for DT/OT on the F/A-18, F-16, B-1, B-2, and B-52
- (U) \$32,932 Total

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604618F Joint Direct Attack Munitions	PROJECT 3890
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(U) FY 1998 (\$ in Thousands):

- (U) \$ 9,521 Continue EMD prime contractor activities for F/A-18, B-1, B-52, and B-2 aircraft. Initiate AV-8B and F-16 integration and testing. Continue redesign of BLU-109 and MK-83 kits.
- (U) \$ 2,943 Continue Support and Management tasks to define and coordinate the program activities of the prime contractor and various government development and test organizations.
- (U) \$ 9,432 Complete B-52 and F/A-18 and continue B-1 and B-2 aircraft flight testing. Continue F-16 aircraft guided flight tests. Test redesign of BLU-109 and MK-83 kits.
- (U) \$21,896 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$ 5,452 Complete EMD prime contractor activities for F/A-18, B-1, B-52, B-2 aircraft. Continue AV-8B and F-16 integration and testing.
- (U) \$ 2,354 Continue Support and Management tasks to define and coordinate the program activities of the prime contractor and various government development and test organizations.
- (U) \$ 4,398 Complete B-1 and B-2 aircraft flight testing. Start AV-8B and continue F-16 aircraft guided tests.
- (U) \$12,204 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	36,993	19,553	12,450	300,156
(U) Appropriated Value	38,636	24,553		
(U) Adjustments to Appropriated Value				
a. Cong Reductions/Gen Reductions	-839	-944		
b. SBIR	-804	-1,713		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-4,061			
(U) Adjustments to Budget Years Since FY 1998 PB			-246	
(U) Current Budget Submit/FY99 President's Budget	32,932	21,896	12,204	293,935

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604618F Joint Direct Attack Munitions	PROJECT 3890
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(U) Change Summary Explanation:
 Funding: FY 1997 Congressional Rescission of \$4M for Bosnia Supplemental. FY98 Congressional transfer of \$5M from Procurement (3011) to fund redesign efforts. FY97 and FY98 changes also due to Congressional General Reductions and SBIR. FY99 change due to changes in inflation projections. In FY98, \$0.2M pending reprogramming to fund higher Air Force priorities and \$0.7M pending reprogramming for additional SBIR reductions.

Schedule: N/A

Technical: N/A

(U) **C. Other Program Funding Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Appropriation: Ammunition Procurement, Air Force, Program Title: JDAM, PE 27583F, BA 01, BP 35, P-1 Line 20									
(U) Ammunition Procurement	23,010	54,949	53,157	127,999	246,016	216,298	210,009	427,814	1,359,252

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604618F Joint Direct Attack Munitions						PROJECT 3890			
(U) D. <u>Schedule Profile</u>														
		<u>FY 1997</u>					<u>FY 1998</u>					<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4		
(U) LRIP (Lot 1) Option			X											
(U) LRIP (Lot 2) Option							X							
(U) Milestone III (2000 lb)										X				
(U) <u>MK-84 Schedule</u>														
(U) DT/OT							X							
(U) Operational Evaluation (OPEVAL) Start/Finish							X	X						
(U) Initial Operational Test & Eval (IOT&E) Start/Finish							X	X						
(U) <u>BLU-109 Schedule</u>														
(U) DT/OT Start/Finish							X							
(U) OPEVAL Start/Finish							X	X						
(U) OT&E Start/Finish							X	X						
(U) <u>MK-83 Schedule</u>														
(U) DT Flight Tests Start							X							
(U) DT Flight Tests Finish										X				
(U) <u>A/C Integration</u>														
(U) Threshold Fighter/Bomber														
(U) -- 2000 lb Complete										X				
(U) -- 1000 lb Start					X									
(U) -- 1000 lb Finish - 1 st Qtr FY03														

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604618F Joint Direct Attack Munitions	PROJECT 3890
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Primary Hardware Development	20,325	9,521	5,452
(U) Test & Evaluation	9,371	9,432	4,398
(U) Engineering & Prog Mgt Support	3,236	2,943	2,354
(U) Total	32,932	21,896	12,204

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Product Development Organizations

Prime Contractors	CPAF	Oct-95	159,439	166,672*	129,425	19,469	9,521	5,452	2,805	166,672
Boeing (St Louis, MO)										
Lockheed/Martin (Orlando, FL; FY94/95 Only)										
Conceptual Studies	Various	Various	N/A	N/A	21,571	856	0	0	0	22,427

* Project Office EAC includes projected increase of contract scope.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604618F Joint Direct Attack Munitions				PROJECT 3890	
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Support and Management Organizations</u>										
Engineering Spt.	CPAF	Oct 96	12,162	12,162	10,495	583	900	184	0	12,162
TAMS	CPAF	Oct 96	4,615	4,615	3,090	497	700	328	0	4,615
Contractor Program Office	Various	Various	N/A	N/A	12,788	2,156	1,343	1,842	377	18,506
<u>Test and Evaluation Organizations</u>										
Aircraft	Various	Various	N/A	N/A	12,276	355	279	2,214	1,013	16,137
SPO/PMA Supt.										
Flight Testing	Various	Various	N/A	N/A	19,552	8,981	8,838	2,184	16	39,571
Ground Testing	Various	Various	N/A	N/A	9,210	35	315	0	0	9,560
GFE	Various	Various	N/A	N/A	4,285	0	0	0	0	4,285
Government Furnished Equipment: Not Applicable										
Subtotal Product Development					150,996	20,325	9,521	5,452	2,805	189,099
Subtotal Support and Management					26,373	3,236	2,943	2,354	377	35,283
Subtotal Test and Evaluation					45,323	9,371	9,432	4,398	1,029	69,553
Total Project					222,692	32,932	21,896	12,204	4,211	293,935

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604703F Aeromedical Systems Development	PROJECT 2866
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2866 Aeromedical/Casualty Care Systems Dev	4,498	3,907	3,336	564	95	0	0	0	TBD
Quantity of RDT&E Articles	0	7/1,350*	8/1,104*	0	0	0	0	0	N/A

* Note: The 7 items to be bought in FY98 are 6 Spinal Cord Injury Transport System (SCITS) units at \$138 thousand each, and 1 Theater Medical Information Program (TMIP) unit at \$522 thousand. The 8 items to be bought in FY 99 are 8 SCITS units at \$138 thousand each.

(U) A. Mission Description and Budget Item Justification

The Program Element provides tactical, strategic, and covert aeromedical evacuation systems and medical treatment equipment to meet unique Air Force medical readiness and operational requirements. Note: This program is in budget activity 5 - Engineering and Manufacturing Development because it supports development of systems for treatment, evacuation, and prediction of wartime casualties in a conventional or non-conventional warfare environment.

(U) Acquisition Strategy

All major projects within this Program Element were awarded under full and open competition.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604703F Aeromedical Systems Development	PROJECT 2866
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$44 Transportable Blood Transshipment Center (TBTC) - Delivered production units and provided program/engineering support. - (U) \$6 SCITS - Developed acquisition strategy and obtained Milestone I/II decision approval to support tri-Service requirements. - (U) \$326 THREAT Model - Integrated nuclear, biological and chemical modules for Build 2, completed integration testing, and delivered Build 3. - (U) \$1 Continuous Intermittent Suction Unit (CISU) - Completed operational testing. - (U) \$808 CHATH/CHAMP - Completed qualification testing. - (U) \$128 Civil Reserve Air Fleet Aeromedical Evacuation Ship Set (CRAF-AESS) - Developed Patient Loading System (PLS) support equipment. - (U) \$1,067 TMIP - Defined, prototyped and demonstrated a deployable medical information infrastructure; planned and initiated an acquisition strategy for the same. - (U) \$518 Aeromedical Systems Analysis - Conducted foundational studies and analyses, requirements analyses, and product demonstrations to meet operational needs, and defined acquisition strategies and baselines for potential system solutions to Air Force Medical Service materiel needs identified through the Air Force Surgeon General's modernization planning process. - (U) \$1,600 Funded proportional efforts of Human Systems Center, System Program Office, and Technical Engineering and Management Support contractor. - (U) \$4,498 TOTAL 		
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$63 TBTC - Program/Engineering Support for production item activation. - (U) \$1036 SCITS - Begin EMD. - (U) \$324 CHATH/CHAMP - Complete operational test and evaluation (OT&E), meet initial operational capability (IOC), obtain Milestone III decision approval and exercise production option. - (U) \$98 CRAF-AESS - Support production decision and Initial Operational Capability (IOC) for the Patient Loading System. - (U) \$1,395 TMIP-Air Force - Integrate and test a deployable medical information infrastructure; plan and initiate a deployment strategy for the same; investigate and plan for pre-planned product improvements. - (U) \$45 Aeromedical Systems Analysis - Conduct foundational studies and analyses, requirements analyses, and product demonstrations to meet operational needs, and define acquisition strategies and baselines for potential system solutions to Air Force Medical Service materiel needs identified through the Air Force Surgeon General's modernization planning process. - (U) \$946 Fund proportional efforts of Human Systems Center, System Program Office, and Technical Engineering and Management Support contractor. Support production unit deliveries for CISU. 		

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BUDGET ACTIVITY	PE NUMBER AND TITLE	
5 - Engineering and Manufacturing Development	0604703F Aeromedical Systems Development	
PROJECT 2866		
- (U) \$3,907	TOTAL	
 (U) <u>FY 1999 (\$ in Thousands):</u>		
- (U) \$1,585	SCITS - Conduct OT&E and complete EMD.	
- (U) \$270	CHATH/CHAMP - Program/Engineering support for production item activation.	
- (U) \$599	TMIP-AF - Execute medical information infrastructure deployment; integrate and test planned product improvements.	
- (U) \$15	CRAF-AESS - Support production effort of the Patient Loading System (PLS).	
- (U) \$77	Aeromedical Systems Analysis - Conduct foundational studies and analyses, requirements analyses, and product demonstrations to meet operational needs, and define acquisition strategies and baselines for potential system solutions to Air Force Medical Service materiel needs identified through the Air Force Surgeon General's modernization planning process. Prepare RFP for Advanced Hybrid Oxygen System - Medical (AHOS-M).	
- (U) \$790	Fund proportional efforts of Human Systems Center, System Program Office, and Technical Engineering and Management Support contractor, including the CISU production effort. Begin transition effort from research effort, exploring the potential technologies for future EMD efforts on the Advanced Hybrid Oxygen System - Medical (AHOS-M).	
- (U) \$3,336	TOTAL	

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604703F Aeromedical Systems Development	PROJECT 2866
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	5,707	4,354	2,057	TBD
(U) Appropriated Value	5,977	4,354		
(U) Adjustments to Appropriated Value				
a. Congressional Gen Reductions	-162	-373		
b. SBIR	-108	-74		
c. Omnibus or Other Above Threshold Reprogramming	-1,200			
d. Below Threshold Reprogramming				
e. Rescissions	-9			
(U) Adjustments to Budget Years Since FY 1998 PB			+1,279	
(U) Current Budget Submit/FY 1999 President's Budget	4,498	3,907	3,336	TBD

(U) Change Summary Explanation:

Funding: FY97: \$1.2 Million was approved by Congress as an Omnibus source; Funds were reduced to meet higher AF requirements.
 FY99: Restores content and funds used for FY97 Omnibus source.

Schedule: No change.

Technical: No change.

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement, AF, PE 28038F, Other Base and Maintenance Support, Medical/Dental Equipment	11,567	7,406	9,112	9,797	8,082	4,630	4,580	Cont	Cont

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604703F Aeromedical Systems Development	PROJECT 2866
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
TRANSPORTABLE BLOOD												
TRANSSHIPMENT CENTER												
- FOC								X				
SPINAL CORD INJURY TRANSPORT SYS												
- Begin EMD						X						
- Begin OT&E												X
THREAT MODEL												
- FOC					*							
CONT/INTERMIT SUCTION UNIT												
- Complete OT&E				*								
- Begin Production					*							
- Complete Production									X			
CHATH/CHAMP												
- Complete DT&E				*								
- Complete OT&E						X						
- Milestone III Decision						X						
- Begin Production						X						
CRAF AES												
- IOT&E for PLS						X						
- IOC for PLS							X					
- FOC for PLS										X		
AHOS-M												
- Prepare RFP												X
TMIP-AF												
- Define Sys performance characteristics							X					
- Integrate and test system solutions											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604703F Aeromedical Systems Development				PROJECT 2866	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Engineering and Manufacturing Development				1,280	1,819	1,701			
(U)	Development/Operational Test and Evaluation				157	36	115			
(U)	Contractor Engineering Support				1,889	1,258	941			
(U)	Miscellaneous (System Program Office Operations)				422	211	165			
(U)	Mission Support/Supplies				750	583	414			
(U)	Total				4,498	3,907	3,336			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
TBTC-A.D. Little	CPAF/FFP	Mar 91	11,033	13,289	13,134	0	0	0	0	13,134
CHATH/CHAMP Ph I-EASI/Guild	CPFF	Dec 94	2,989	2,989	2,989	0	0	0	0	2,989
CHATH/CHAMP Phase II- ERDC/EASI	CPFF	Aug 95	3,853	3,853	3,609	287	0	0	0	3,896
SCITS	TBD	TBD	TBD	TBD	0	0	784	1,302	466	2,552
CRAF (PLS)		TBD	TBD	TBD	0	40	0	0	0	40
WAR-MED PS- BDM	CPAF	May 96	6,159	6,159	6,159	0	0	0	0	6,159
TMIP-AF	Various	Various	TBD	TBD	0	808	1,035	400	120	2,363
THREAT-BDM	CPFF	Aug 94	1,453	1,453	1,308	145	0	0	0	1,453
Project 2866					Page 6 of 7 Pages			Exhibit R-3 (PE 0604703F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604703F Aeromedical Systems Development				PROJECT 2866	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
New Business-Mission Support/Supplies	Various	Various			17,477	0	0	0	0	17,477
	Various	Various			532	810	583	414	0	2,339
Sub-Total					45,208	2,090	2,402	2,116	586	52,402
<u>Support/Mgmt Organizations</u>										
TEAMS-OpTech, McDonald Tech, MTC	Delivery Order	Various			3,061	1,829	1,258	941	0	7,089
SPO Operations	Various	Various			3,767	422	211	165	73	4,638
Sub-Total					6,828	2,251	1,469	1,106	73	11,727
<u>Test and Evaluation Organizations</u>										
Aberdeen Prov. Grnd					2	157	36	0	0	195
Armstrong Lab					0	0	0	77	0	77
Other					138	0	0	37	0	175
Sub-Total					140	157	36	114	0	447
Government Furnished Property:		None								
Subtotal Product Development					45,208	2,090	2,402	2,116	586	52,402
Subtotal Support and Management					6,828	2,251	1,469	1,106	73	11,727
Subtotal Test and Evaluation					140	157	36	114	0	447
Total Project					52,176	4,498	3,907	3,336	659	64,576

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604706F Life Support Systems				PROJECT 412A	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
412A Life Support Systems	10,289	4,301	3,744	3,747	3,848	537	0	0	26,466
Quantity of RDT&E Articles	53/426K*	45/270*	4/560K*	158/636K*	0	0	0	0	260

*Fiscal Year (FY) 1997: (2) Advanced Concept Ejection Seats (ACES II) at 60K per item; (51) Advanced Technology Concept Anti-Gravity Suits (ATAGS) at 6K per item. FY1998: (45) ATAGS at 6K per item. FY1999: (4) ACES II ejection seats at 140K per item (full-scale configuration). FY2000: (79) tractor rockets for ACES II at 4K per item; (27) Enhanced Drogue rocket containers for ACES II, at 9K per item; (25) parachutes for ACES II at 2K per item; (27) cable assemblies for ACES II at 1K per item.

(U) **A. Mission Description and Budget Item Justification**
 This project provides for Engineering, Manufacturing, and Development (EMD) of life support equipment and subsystems to satisfy operational command requirements for improved life support equipment. This project also provides for the continuing development of life support items and subsystems such as the following: flight helmets, oxygen breathing equipment for aviators, anti-G coveralls, survival radios, night vision devices, active/passive noise reduction devices, parachute releases, and aircraft ejection seats. Program management support includes tasks to assess deficiencies of currently fielded equipment. It also provides for the transitions of new technology into EMD and to support all current life support projects. Life Support System's contractors are ITT Electro-Optical Products Division, Krug Life Sciences, Boeing Co., System Research Laboratories (SRL), and Mustang Survival. Life Support efforts result from full and open competition among qualified vendors to select a single primary source for EMD and follow-on production.

(U) **Acquisition Strategy:** Acquisition strategy is incorporated at the project level.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604706F Life Support Systems	412A
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,821 Laser Eye Protection (LEP) - for dye-based dielectric coated aircrew visors and technology demonstrations - (U) \$1,482 ACES II Component Improvement Program (CIP) - technology demonstrations - (U) \$500 Continued reviews and audits for Night Vision System (NVS) EMD - (U) \$2,256 Continued Government Developmental Testing & Evaluation (DT&E) & Initial Operational Testing & Evaluation (IOT&E) on NVS test assets - (ejection sled testing) - (U) \$1,107 Initiated EMD for the Advanced Technology Concept Anti-Gravity Suit (ATAGS) design for all fighter aircraft - (U) \$123 Program Management/Technical Support/Travel/Test & Evaluation in support of AF Life Support Systems - (MAC-10/100 - anti-exposure suit, Joint Strike Fighter (JSF) program, Oxygen Generating Systems (OGS), Panoramic Night Vision Goggles (PNVGs), Joint Helmet Mounting Cueing System (JHMCS), Integrated Chin-Nape Strap (ICNS), Active Noise Reduction (ANR), Universal Water Activated Release Systems (UWARS), Low Profile Parachute (LPP), Female Aircrew Member Bladder Relief Capability (FAMBRC), Combat Survivor Evader Locator (CSEL), Automatic Life Preserver, F-22 Integration of Current Life Support Systems Evaluation, Joint Aircrew Survival Vest (AIRSAVE), Visually Coupled Targeting and Acquisition System (VCATS), HGU-55P Lightweight Helmet, Laser Eye Protection (LEP), ACES II Advanced Recovery Sequencer (ARS). - (U) \$10,289 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$700 Complete NVS EMD contract, DT&E (combined with IOT&E) and production support costs - (U) \$1,216 Initiate Air Force funded EMD program to continue development for ACES II CIP - follow-on work to FY97 Congressional add - (U) \$1,112 Continue ATAGS EMD - (U) \$1,000 Congressional add for ejection seats - (U) \$273 Program Management/Technical Support/Travel/Test & Evaluation in support of AF Life Support Systems - (MAC-10/100 - anti-exposure suit, Joint Strike Fighter (JSF) program, Oxygen Generating Systems (OGS), Panoramic Night Vision Goggles (PNVGs), Joint Helmet Mounting Cueing System (JHMCS), Integrated Chin-Nape Strap (ICNS), Active Noise Reduction (ANR), Universal Water Activated Release Systems (UWARS), Low Profile Parachute (LPP), Female Aircrew Member Bladder Relief Capability (FAMBRC), Combat Survivor Evader Locator (CSEL), Automatic Life Preserver, F-22 Integration of Current Life Support Systems Evaluation, Joint Aircrew Survival Vest (AIRSAVE), Visually Coupled Targeting and Acquisition System (VCATS), HGU-55P Lightweight Helmet, Laser Eye Protection (LEP), ACES II Advanced Recovery Sequencer (ARS). - (U) \$4,301 Total 		
Project 412A	Page 2 of 7 Pages	Exhibit R-2 (PE 0604706F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604706F Life Support Systems	412A
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,671 Continue ACES II CIP EMD - (U) \$43 Complete ATAGS EMD and production support costs - (U) \$30 Program Management/Technical Support/Travel/Test & Evaluation in support of AF Life Support Systems - (MAC-10/100 - anti-exposure suit, Joint Strike Fighter (JSF) program, Oxygen Generating Systems (OGS), Panoramic Night Vision Goggles (PNVGs), Joint Helmet Mounting Cueing System (JHMCS), Integrated Chin-Nape Strap (ICNS), Active Noise Reduction (ANR), Universal Water Activated Release Systems (UWARS), Low Profile Parachute (LPP), Female Aircrew Member Bladder Relief Capability (FAMBRC), Combat Survivor Evader Locator (CSEL), Automatic Life Preserver, F-22 Integration of Current Life Support Systems Evaluation, Joint Aircrew Survival Vest (AIRSAVE), Visually Coupled Targeting and Acquisition System (VCATS), HGU-55P Lightweight Helmet, Laser Eye Protection (LEP), Night Vision System (NVS), ACES II ARS. - (U) \$3,744 Total 		
Project 412A	Page 3 of 7 Pages	Exhibit R-2 (PE 0604706F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE						PROJECT		
5 - Engineering and Manufacturing Development	0604706F Life Support Systems						412A		
 (U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			<u>Total</u> <u>Cost</u>			
(U) Previous President's Budget	10,391	3,726	3,819			26,288			
(U) Appropriated Value	10,863	*4,726							
(U) Adjustments to Appropriated Value									
a. Congressional General Reduction	-240	-330							
b. Omnibus & Other Above Threshold Reprogramming									
c. Small Business Innovative Research (SBIR)	-232	-95							
d. Below Threshold Reprogramming (BTR)	-85								
e. Rescissions	-17								
(U) Adjustments to Budget Years since FY98 PB			-75						
(U) Current Budget Submit/99 President's Budget	10,289	4,301	3,744			26,466			
 (U) Change Summary Explanation:									
<p>Funding: FY97 \$85K reprogrammed to PE27268F, Aircraft Engine Component Improvement Program. *FY98 \$1M Congressional add for ejection seats -- this Congressional add is in the process of being reclassified to PE603231F, Crew Systems Technology, per Congressional request. LEP effort was terminated due to the lack of procurement funds and Air Force requirements met by parallel Navy program. Of the \$1.8M allocated for LEP, \$1.4M is reallocated to ACES II CIP and \$400K to F-22 ATAGS development. FY99 \$75K reduction for inflation adjustment.</p> <p>Schedule: Enhanced drogue tractor rocket development was delayed due to facility scheduling problems by the contractor. NVS DT/OT delays due to range schedule conflicts.</p> <p>Technical: No Change</p>									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY1998</u>	<u>FY1999</u>	<u>FY2000</u>	<u>FY2001</u>	<u>FY2002</u>	<u>FY2003</u>	<u>To</u> <u>Complete</u>	<u>Total Cost</u>
NATO Cooperative R&D PE 0603790D (OSD funded) ACES II CIP	0	500	0	0	0	0	0	0	500
NATO Cooperative R&D PE 0603790F	0	0	1500	1500	0	0	0	0	3000
Project 412A								<i>Page 4 of 7 Pages</i>	Exhibit R-2 (PE 0604706F)

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BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
0604706F Life Support Systems

(AF funded) ACES II CIP

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604706F Life Support Systems	PROJECT 412A
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(U) D. <u>Schedule Profile</u>	<u>FY1997</u>				<u>FY1998</u>				<u>FY1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Started NVS Contractor Qual Test	*											
(U) Started UWARS Production Deliveries		*										
(U) Initiated ACES II CIP - preliminary design and test			*									
(U) Initiated LEP program (AL & Navy)			*									
(U) Awarded F-22 ATAGS Contract				*								
(U) Completed Government Conducted NVS DT&E / OT&E					*							
(U) Production Award for NVS						X						
(U) ACES II Pre-EMD						X						
(U) Receive ATAGS OT&E							X					
(U) EMD award for ACES II CIP								X				
(U) NVS Production First Delivery									X			
(U) Complete UWARS Prod. Deliveries										X		
(U) Complete detail design for ACES II											X	
(U) Start Qual. Testing for ACES II												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604706F Life Support Systems			PROJECT 412A		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Contracts				6,797	1,434	1,226				
(U) Technical Engineering Support				1,475	1,061	964				
(U) Travel				204	239	193				
(U) Government Testing				1,394	43	1,100				
(U) Program Management/Technical Support and Misc.				419	1,524	261				
(U) Total				10,289	4,301	3,744				
 (U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to Complete	Total <u>Program</u>
<u>Product Development Organizations</u>										
ITT-NVS	C/CPIF	18 Jan 93	14,081	14,081	13,630	270	181	0	0	14,081
KRUG-ATAGS	SS/FFP	7 July 97	424	424	0	424	0	0	0	424
Mustang-ATAGS	SS/FFP	Aug 97	749	749	0	271	478	0	0	749
LEP - (AL/Navy)	C/CPFF	Jun 97	4,552	4,552	0	4,552	0	0	0	4,552
MDA-Enhanced	SS/CPFF	Jun 97	1,130	1,130	0	1,130	0	0	0	1,130
Drogue										
Boeing-ACES II	SS/CPFF	Feb 98	275	275	0	0	275	0	0	275
Pre-EMD										
MDA-ACES II	SS/FFP	Sep 97	1,010	1,010	0	150	350	510	0	1,010
Boeing-ACES II	SS/CPFF	Nov 98	2,836	2,836	0	0	0	716	2120	2,836
EMD										
Project 412A										
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Exhibit R-3 (PE 0604706F)										

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BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
0604706F Life Support Systems

Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
SRL-ATAGS DT&E Support	SS/CPFF	Dec 97	150	150	0	0	150	0	0	150

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604706F Life Support Systems					PROJECT 412A
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
			4,053	4,053	2,132	419	524	261	717	4,053
			1,381	1,381	347	204	239	193	398	1,381
			8,387	8,387	2,560	1,475	1,061	964	2,327	8,387
							1,000			1,000
<u>Test and Evaluation Organizations</u>										
		Proj Ord-Various	4,361	4,361	3,103	1,215	43	0	0	4,361
		Various	179	179	0	179	0	0	0	179
		Various	3,471	3,471	0	0	0	1,100	2,371	3,471
		Various	233	233	0	0	0	0	233	233
Government Furnished Property:		None								
			25,207	25,207	13,630	6,797	1,434	1,226	2,120	25,207
			13,821	13,821	5,039	2,098	1,824	1,418	3,442	13,821
			8,244	8,244	3,103	1,394	43	1,100	2,604	8,244
							1,000			1,000
			47,272	47,272	21,772	10,289	4,301	3,744	8,166	48,272

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	2,613	2,526	2,715	2,768	2,824	2,864	2,917	0	TBD	Continuing
2054 Aerospace Facilities Engineering Development	672	0	0	0	0	0	0	0	0	1,570
2505 Aircraft Firefighting Suppression And Rescue	1,129	2,339	2,528	2,585	2,634	2,672	2,722	0	TBD	Continuing
2674 Tactical Shelters	152	187	187	183	190	192	195	0	TBD	Continuing
3788 Environmental Quality	660	0	0	0	0	0	0	0	0	2,739

(U) A. Mission Description and Budget Item Justification

This program funds the development, testing and evaluation of materials, equipment and procedures in the following areas: (1) Aircraft Fire Fighting, Suppression and Rescue and Civil Engineer (CE) Readiness, and (2) Tactical Shelters. Overall CE readiness is supported by multimedia training systems for Fire Fighting, CE readiness (Disaster Preparedness, Chem/Bio) and Force Protection (Explosive Ordnance Disposal (EOD)) by developing interactive training scenarios which simulate hazardous situations, allows both training and testing of response capabilities, and complements field training while reducing time, cost and direct exposure to hazards. Develops new concepts and technology applications for fire fighting, suppression and rescue to provide rapidly deployable capabilities to support bare base, contingency operating areas or main operating bases, and to reduce fire risks to personnel and resources. 2) Tactical Shelters is the USAF portion of a tri service effort to develop standardized, low maintenance, highly survivable shelters and shelter accessories that are easily mobilized and compatible with air, sea and land transport systems. These products will effectively support high mobility aircraft support, command and control, communications, medical, and data processing units for the tactical and strategic forces. These shelters also optimize the latest enhancements of force protection technology. This program is in budget activity five, Engineering and Manufacturing Development, because it takes emerging technologies and concepts and develops them for Air Force use.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	2,617	2,698	2,770	Continuing
(U) Appropriated Value	2,736	2,698		
(U) Adjustments to Appropriated Value				
a. Cong/General Reductions	-69	-107		
b. SBIR	-50	-65		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-4			
(U) Adjustments to Budget Years Since FY 1998 PB			-55	
(U) Current Budget Submit/FY1999 President's Budget	2,613	2,526	2,715	
 (U) Change Summary Explanation:				
Funding: None.				
Schedule: None				
Technical: None				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> N/A				
 (U) D. <u>Schedule Profile</u> N/A				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter	PROJECT 2054
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	Cost to Complete	Total Cost
2054 Aerospace Facilities Engineering Development	672	0	0	0	0	0	0	0	0	1,570

(U) A. Mission Description and Budget Item Justification

Develops equipment, materials, and procedures to improve the operational effectiveness of aerospace facilities.

(U) Acquisition Strategy:

EMD for the program completed in FY97 and program transition to PE 28031 for procurement.

(U) FY 1997 (\$ in Thousands):

- (U) \$547 Completed EMD for Small Shelters/Environmental Control Units (ECUs)
- (U) \$125 Continued other technical support
- (U) \$672 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0
- (U) \$
- (U) \$0 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$0
- (U) \$
- (U) \$0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter			PROJECT 2054			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>		<u>Total</u>			
							<u>Cost</u>			
(U) Previous President's Budget FY98 PB		689	0	0	0		1,570			
(U) Appropriated Value		689								
(U) Adjustments to Appropriated Value										
a. Cong Reductions		-17								
b. SBIR										
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming										
(U) Adjustments to Budget Years Since FY 1998 PB										
(U) Current Budget Submit/FY 1999 President's Budget		672					1,570			
 (U) Change Summary Explanation:										
Funding: FY 97 Congressional reductions of \$17K										
Schedule: N/A										
Technical: N/A										
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> N/A										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U) Other Procurement, AF, Other Base										
Maintenance and Support Program:										
Mobility Equipment (0208031F) (WSC 845420)		21,478	24,048	35,973	35,757	37,667	13,179	13,423	Cont	Cont
Project 2054		Page 4 of 21 Pages					Exhibit R-2 (PE 0604708F)			

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter	PROJECT 2054
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
SMALL SHELTER SYSTEMS												
- Milestone I/II Decision	X											
- Award Evaluation Contract with Production Options					X							
- Milestone III Decision							X					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter				PROJECT 2054	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Contracts					287					
(U) A&AS Support					260					
(U) Other Government Agencies										
(U) Materials/Equipment										
(U) Other Technical Support					125					
(U) Total					672	0		0		
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Small Shelters/ECUs	C/FFP	Aug 97	1,500	1,500	748	547	0	0	0	1,295
<u>Support and Management Organizations</u>										
N/A			400	400	150	125	0	0	0	275
<u>Test and Evaluation Organizations</u>										
N/A					0	0	0	0	0	0
Government Furnished Property: None										
Project 2054					Page 6 of 21 Pages			Exhibit R-3 (PE 0604708F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter	PROJECT 2054
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
Subtotal Product Development					748	547	0	0	0	1,295
Subtotal Support and Management					150	125	0	0	0	275
Subtotal Test and Evaluation						0	0	0	0	0
Total Project					898	672	0	0	0	1,570

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter	PROJECT 2505
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	Cost to Complete	Total Cost
2505 Aircraft Firefighting Suppression And Rescue	1,129	2,339	2,528	2,585	2,634	2,672	2,722	0	TBD	Continuing

(U) A. Mission Description and Budget Item Justification

Develops improved civil engineering, fire fighting suppression and rescue equipment, materials, and methods to increase fire protection, readiness, force protection, mobility, and disaster preparedness effectiveness and training.

(U) Acquisition Strategy:

Courseware materials will continue to be developed, tested, modified and readied for production and procurement by field units.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 863 Continued courseware development of civil engineer (CE)/Firefighter Multimedia Training System (FMFS) systems.
- (U) \$ 237 Continued commercial technology exploitation.
- (U) \$ 29 Other technical support.
- (U) \$ 1,129 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$1,728 Continued courseware development of CE/FMFS systems.
- (U) \$ 146 Continued commercial technology exploitation.
- (U) \$ 465 Other technical support.
- (U) \$2,339 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$2,040 Continued courseware development of CE/FMFS systems.
- (U) \$ 140 Continued commercial technology exploitation.
- (U) \$ 348 Other technical support.
- (U) \$2,528 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)						DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter			PROJECT 2505
(U) B. <u>Program Change Summary (\$ in Thousands)</u>							
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget FY98PB		1,049		1,060		1,098	Cont
(U) Appropriated Value		1,116		2,496			
(U) Adjustments to Appropriated Value							
a. Cong/General Reductions		38		-96			
b. SBIR		-25		-61			
c. Omnibus or Other Above Threshold Reprogram							
d. Below Threshold Reprogramming							
(U) Adjustments to Budget Years Since FY 1998 PB						690	
(U) Current Budget Submit/FY1999 President's Budget		1,129		2,339		2,528	Cont
 (U) Change Summary Explanation:							
Funding: None.							
Schedule: N/A							
Technical: N/A							
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> N/A							
 (U) D. <u>Schedule Profile</u>							
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>	
	1	2	3	4	1	2	3
					2	3	4
CE MULTIMEDIA TRAINING SYS							
- Complete B1B/F-16/C-17/747/F-18		X					
- Complete C-130/KC-135/RC-135				X			
- Complete F-117				X			
- Complete CRAF Aircraft						X	
FIRE COMMERCIAL TECHNOLOGY EXPLOITATION							
- Complete FY97 AFOTEC Evaluation			X				
- Complete FY98 AFOTEC Evaluation						X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter			PROJECT 2505		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Contracts					500	1,353	1,200			
(U) A&AS Support					352	324	780			
(U) Other Government Agencies					175	177	180			
(U) Materials/Equipment					73	20	20			
(U) Other Technical Support					29	465	348			
(U) Total					1,129	2,339	2,528			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Multimedia	Mult	Cont	14,500	14,500	498	863	1,728	2,040	Cont	Cont
Training Systems										
Fire Commercial Technology Exploitation	Mult	Cont	1,500	1,500	250	85	31	60	Cont	Cont
<u>Support and Management Organizations</u>										
Various			1,950	1,950	150	29	465	348	Cont	Cont
<u>Test and Evaluation Organizations</u>										
Various			750	750	0	152	115	80	Cont	Cont
Government Furnished Property: None										
Project 2505					Page 10 of 21 Pages			Exhibit R-3 (PE 0604708F)		

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter	PROJECT 2505
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Subtotal Product Development					748	948	1,759	2,100	Cont	TBD
Subtotal Support and Management					150	29	465	348	Cont	TBD
Subtotal Test and Evaluation					0	152	115	80	Cont	TBD
Total Project					898	1,129	2,339	2,528	Cont	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter			PROJECT 2674		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	Cost to Complete	Total Cost
2674 Tactical Shelters	152	187	187	183	190	192	195	0	TBD	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>Provides reliable, cost effective tactical shelters required to ensure the success of Air Force missions, provides Air Force membership in the DOD Tactical Shelter Program, and provides technology insertion for shelter development.</p> <p>(U) <u>Acquisition Strategy:</u> Tactical shelters development will continue to support Initial Deployable Kitchen (IDK) Program.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 75 Continue research, development and acquisition of the Modular Extendible Ridged Wall Shelter (MERWS) - (U) \$ 67 Establish capability to evaluate shelter design and performance and perform system integration analysis - (U) \$ 10 Provide direct feedback and ensure Air Force requirements identified to Joint Committee for Tactical Shelters (JOCOTAS) and ASTM - (U) \$152 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 75 Continue research, development and acquisition of the Modular Extendible Ridged Wall Shelter (MERWS) - (U) \$102 Establish capability to evaluate shelter design and performance and perform system integration analysis - (U) \$ 10 Provide direct feedback and ensure Air Force requirements identified to Joint Committee for Tactical Shelters (JOCOTAS) and ASTM - (U) \$187 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 75 Continue research, development and acquisition of the Modular Extendible Ridged Wall Shelter (MERWS) - (U) \$102 Establish capability to evaluate shelter design and performance and perform system integration analysis - (U) \$ 10 Provide direct feedback and ensure Air Force requirements identified to Joint Committee for Tactical Shelters (JOCOTAS) and ASTM - (U) \$187 Total 										
Project 2674			<i>Page 12 of 21 Pages</i>				Exhibit R-2 (PE 0604708F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter			PROJECT 2674		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	MERWS program				75	75	75			
(U)	Shelter design, performance and analysis				67	102	102			
(U)	JOCOTAS program				10	10	10			
(U)	Total				152	187	187			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
MERWS program	Multiple	Multiple				75	75	75	Cont	Cont
Shelter design, performance and analysis	Multiple	Multiple				67	102	102	Cont	Cont
JOCOTAS program	Multiple	Multiple				10	10	10	Cont	Cont
<u>Support and Management Organizations</u>										
N/A						0	0	0	0	
<u>Test and Evaluation Organizations</u>										
N/A						0	0	0	0	0
Project 2674					Page 14 of 21 Pages			Exhibit R-3 (PE 0604708F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter	PROJECT 2674
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: None

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				*16,310	152	187	187	Cont	TBD
Subtotal Support and Management				0	0	0	0	0	0
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				*16,310	152	187	187	Cont	TBD

* = Prior year funding could not be broken out in above categories

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter	PROJECT 3788
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	Cost to Complete	Total Cost
3788 Environmental Quality	660	0	0	0	0	0	0	0	0	2,739

(U) A. Mission Description and Budget Item Justification

Develops equipment, materials, and processes in support of the Air Force environmental program including pollution prevention, compliance, restoration, and conservation. The focus is on technologies to reduce and eliminate pollutant sources, provide cost effective waste disposal, conduct remediation, and mitigate the effects of wastes and pollutants.

(U) Acquisition Strategy:

Demonstrate, test and validate innovative and promising environmental technologies that eliminate/reduce pollution, comply with environmental regulations and pursue/meet AF goals.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
5 - Engineering and Manufacturing Development		February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604708F Civil, Fire, Environmental, Shelter	3788
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$413 Compliance - Green Aerospace Ground Support Equipment (Green AGSE), JP-8 Fuel Emissions characterization, and Open Path Analyzers - (U) \$106 Pollution Prevention - Continue developmental roadmap for metal plating/metal finishing - (U) \$141 Commercial/lab technology assessment and exploitation - (U) \$660 Totals <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$0 - (U) \$0 - (U) \$0 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$0 - (U) \$0 - (U) \$0 Total <p>(U) <u>FY 2000 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U)\$0 - (U)\$0 - (U)\$0 Total 		
Project 3788	Page 17 of 21 Pages	Exhibit R-2 (PE 0604708F)

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3) DATE **February 1998**

BUDGET ACTIVITY **5 - Engineering and Manufacturing Development** PE NUMBER AND TITLE **0604708F Civil, Fire, Environmental, Shelter** PROJECT **3788**

(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
Compliance	413	0	0
Pollution Prevention	106	0	0
Commercial/lab technology assessment and exploitation	141	8	0
Total	660	0	0

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter				PROJECT 3788	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Product Development Organizations</u>										
Compliance	Multiple	Multiple				413	0	0	0	2,739
Pollution Prevention	Multiple	Multiple				106	0	0	0	106
Comm Techn	Multiple	Multiple				141	0	0	0	141
<u>Support and Management Organizations</u>										
None						0	0	0	0	0
<u>Test and Evaluation Organizations</u>										
None						0	0	0	0	0

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604708F Civil, Fire, Environmental, Shelter	PROJECT 3788
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: None

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				2,079	660	0	0	0	2,739
Subtotal Support and Management				0	0	0	0	0	0
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				2,079	660	0	0	0	2,739

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604727F Joint Standoff Weapon Systems	PROJECT 1000
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1000 Joint Standoff Weapon Systems	22,039	21,992	15,134	10,495	1,540	0	0	0	196,388
Quantity of RDT&E Articles	19/*	8/*	0	0	0	0	0	0	27/*

* Costs of RDT&E articles are not individually priced due to variations in test configurations

(U) A. Mission Description and Budget Item Justification

The Joint Standoff Weapon (JSOW) is an air-to-ground weapon designed to attack a variety of targets during day, night, and adverse weather conditions. JSOW will enhance aircraft survivability as compared to current interdiction weapon systems by providing the capability for launch aircraft to standoff outside the range of enemy point defenses. The JSOW launch-and-leave capability will allow several target kills per aircraft sortie. Integration of the JSOW baseline weapon, the AGM-154A (BLU-97 Combined Effects Bomblets), and the JSOW anti-armor weapon, the AGM-154B (BLU-108 submunition), with the threshold F-16C/D Block 50 aircraft is also included. The program provides for development and test of a dispenser design for the JSOW/BLU-108 variant which employs a BLU-108/B submunition payload. Future integration (objective aircraft) is planned with the B-1B, F-16C/D Block 40, and F-15E. B-2 and B-52 integration is currently underway; B-2 is funding its own integration while B-52 integration is being funded by both JSOW and JASSM. The JSOW program also includes the development of Common Munitions BIT (Built-In Test) Reprogramming Equipment (CMBRE) software which is a tester for JSOW, Joint Direct Attack Munition (JDAM), Wind Corrected Munitions Dispenser (WCMD), and future smart weapons. Also included in this program element is funding for the development of the BRU-55, a MIL-STD-1760 dual-carriage ejector rack capable of carrying smart munitions. BRU-55 will allow the F-16C/D to carry four smart weapons including JSOW (a JSOW threshold requirement), 1000 lb JDAM, and WCMD. JSOW is a joint Air Force/Navy program; Navy is the lead service with the Air Force funding development of the JSOW/BLU-108 variant. JSOW is an ACAT ID program. The RDT&E Budget Activity is 5. Engineering and Manufacturing Development. Milestone II was completed 26 April 1995.

(U) B. Acquisition Strategy

JSOW used a competitively selected prime contractor for E&MD. A Cost Plus Incentive Fee (CPIF) contract was awarded for AGM-154A LRIP I. For AGM-154A LRIP II, a Fixed Price Incentive Fee (FPIF) contract was awarded. Both LRIP contracts were conducted in a sole source environment. A sole source AGM-154B LRIP contract will be awarded in FY99.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 13,938 - Planned, designed, and produced Initial Operational Test & Evaluation test vehicles, and associated Systems Engineering Program Management (SEPM); continued development/test Air Force Mission Support System (AFMSS) module
- (U) \$ 153 - Government Furnished Equipment (GFE) (BLU-108 developmental submunition)
- (U) \$ 2,220 - Planned and conducted Developmental Test & Evaluation (DT&E)
- (U) \$ 3,099 - Continued engineering support, program office support, Navy technical support at China Lake, and other government support
- (U) \$ 2,629 - Continued BRU-55 integration and testing; procured JSOW test assets to support BRU-55 testing
- (U) \$ 22,039 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604727F Joint Standoff Weapon Systems	PROJECT 1000
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 12,315 - Continue JSOW/BLU-108 development and associated SEPM; continue development/test AFMSS module and JSOW CMBRE software - (U) \$ 300 - GFE (BLU-108 developmental submunition) - (U) \$ 858 - Complete JSOW DT&E flight testing - (U) \$ 4,093 - Continue engineering support, program office support, Navy technical support at China Lake, and other government support - (U) \$ 4,426 - Continue BRU-55 development, integration, and flight testing - (U) \$ 21,992 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 9,276 - Complete development and test of B-52 AFMSS module; conduct beddown training; continue integration and planning support for B-1B and F-15E; Conduct design-to-cost initiatives that make JSOW BLU-108 more reliable and allow increased performance - (U) \$ 2,110 - Continue engineering support, program office support, and Navy technical support at China Lake - (U) \$ 3,320 - Complete BRU-55 flight and ground tests; complete BRU-55 EMD; continue F-16 Operational Flight Program (OFP) software development - (U) \$ 428 - F-16 self-targeting/F-16 production OFP verification; F-16/BRU-55 developmental testing - (U) \$ 15,134 Total 		
Project 1000	Page 2 of 6 Pages	Exhibit R-2 (PE 0604727F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development			PE NUMBER AND TITLE 0604727F Joint Standoff Weapon Systems				PROJECT 1000			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>					
					<u>Cost</u>					
(U) Previous President's Budget (FY 1998 PB)		22,463	24,676	23,139	211,300					
(U) Appropriated Value		23,563	24,676							
(U) Adjustments to Appropriated Value										
a. Cong/Gen Reductions		-505	-853							
b. SBIR		-595	-1831							
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming		-387	*							
e. Rescissions		-37								
(U) Adjustments to Budget Years Since FY 1998 PB				-8,005						
(U) Current Budget Submit/FY1999 President's Budget		22,039	21,992	15,134	196,388					
(U) Change Summary Explanation:										
Funding: FY97 BTR transfers excess funds to support research for the development of a miniaturized, near-precision conventional weapon and internal carriage technology. \$4M FY99 funds transferred to PE 0207324F (JSOW procurement) to support FY99 BRU-55 production start. \$3.7M FY99 funds transferred for other higher priorities. \$305K FY99 funds taken as an inflation adjustment.										
* An additional \$524K is pending reprogramming in FY98 to fund other higher priorities.										
Schedule: Delays BLU-108 P3I integration.										
Technical: None										
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	
								<u>Compl</u>	<u>Total</u>	
(U) Appropriation: Missile Procurement (3020), Air Force, Program Title: JSOW, PE 0207324F BA-02, BP-20, P-1 Line 4		0	18,528	41,724	89,431	115,095	123,859	169,153	1,159,567	1,736,873
(U) SEEK EAGLE (PE 0207590F)		7,986	1,112	10,418	0	0	0	0	0	19,516

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604727F Joint Standoff Weapon Systems	PROJECT 1000
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
1	2	3	4	1	2	3	4	1	2	3	4	
<u>Acquisition Milestones</u>												
JSOW/BLU-108 Critical Design Review	*											
BRU-55 Critical Design Review				*								
BRU-55 Development/Testing Completion							X					
BRU-55 Production Contract										X		
JSOW/Baseline Production Award (LRIP 2/ First AF buy)				*								
JSOW/Baseline Milestone III/FRP								X				
JSOW/BLU-108 LRIP Decision								X				
USAF JSOW RAA FY00												
JSOW/BLU-108 Milestone III/FRP											FY02	
<u>T&E Milestones</u>												
JSOW/BLU-108 DT&E (Start/Complete)	*								X			
JSOW/BLU-108 System Qualification Test (Start/Complete)	*				X							
JSOW/BLU-108 IOT&E											FY00	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604727F Joint Standoff Weapon Systems	PROJECT 1000
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Major Contracts	13,938	12,315	9,276
(U) Support Contracts	2,542	3,403	1,690
(U) Program Office Support/Other government support	557	690	420
(U) Test and Evaluation	2,220	858	428
(U) Government Furnished Equipment (GFE)	153	300	0
(U) BRU-55	2,629	4,426	3,320
TOTAL	22,039	21,992	15,134

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604727F Joint Standoff Weapon Systems					PROJECT 1000
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Raytheon System Company (RSC)	SS/CPIF	Jun 95	136,039	136,039	92,094	13,938	12,315	9,276	8,416	136,039
Lockheed M Tech	FP/CPIF	Feb 95	18,020	18,020	8,900	800	3,000	3,320	2,000	18,020
	FP/CPIF	Oct 95	8,720	8,720	5,465	1,829	1,426	0	0	8,720
<u>Support and Management Organizations</u>										
China Lake NWC	MIPR	Apr 97	N/A	N/A	2,790	758	800	500	100	4,948
ASC/YH & Other			N/A	N/A	8,771	2,341	3,293	1,610	1,519	17,534
<u>Test and Evaluation Organizations</u>										
AFDTC, Eglin AFB	PO	Apr 97	N/A	N/A	3,341	2,220	858	428	0	6,847
Government Furnished Property:										
<u>Product Development Organizations</u>										
Textron	FPIF	Mar 96	4,280	4,280	3,827	153	300	0	0	4,280
<u>Support and Management Organizations</u>										
None										
<u>Test and Evaluation Organizations</u>										
None										
Subtotal Product Development					110,286	16,720	17,041	12,596	10,416	167,059
Subtotal Support and Management					11,561	3,099	4,093	2,110	1,619	22,482
Subtotal Test and Evaluation					3,341	2,220	858	428	0	6,847
Total Project					125,188	22,039	21,992	15,134	12,035	196,388
Project 1000					Page 6 of 6 Pages			Exhibit R-3 (PE 0604727F)		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604735F Combat Training Ranges	PROJECT 2286
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2286 Combat Training Range Equipment	26,490	19,131	14,581	12,984	14,011	14,706	14,982	Continuing	Continuing
Quantity of RDT&E Articles	4*	0	0	0	0	0	0	0	4

Note: * AMODSM - Quantity of RDT&E Articles: 4 Not Separately Priced (NSP)

(U) A. Mission Description and Budget Item Justification

This program develops the electronic, telecommunications, and instrumentation equipment/systems for training ranges worldwide. These systems provide real-time monitoring and control of aircrew air-to-air, air-to-ground, and electronic warfare training along with the ability to record events for crew debriefing and analysis. The primary developmental effort is the Nellis Air Combat Training System (NACTS) at Nellis AFB. NACTS is a Global Positioning System (GPS) based system to replace the current Red Flag Measurement and Debriefing System (RFMDS) increasing to 100 the number of instrumented participants, improving aircraft position tracking accuracy, expanding range coverage, multiplying weapons simulations and adding electronic warfare threat/aircrew interaction. The development effort involves software development to increase the number of high activity players as well as the integration and test of the training system comprised of ground equipment and aircraft pods purchased by procurement funding. This program element also funds the continued development of advanced electronic threats, aircraft/pod interfaces, software interoperability among service ranges and the encryption of range/aircraft data links. This program develops the Advanced Message Oriented Data Security Module (AMODSM) communications security equipment. This program is in budget activity 5 - Engineering and Manufacturing Development because the Combat Training Ranges (CTR) Program directly contributes to the effectiveness and survivability of US combat forces by developing range instrumentation and training systems to increase the effectiveness of the training spectrum from individual aircrew skill training to large-scale exercises.

(U) Acquisition Strategy:

. The acquisition strategy is competitive, with cost plus contracts

(U) FY 1997 (\$ in Thousands):

- (U) \$4,031 Continued Combat Training Ranges (CTR) basic operating support, and system acquisition and engineering support for range and threat systems
- (U) \$9,208 Continued Engineering and Development (EMD) of NACTS
 - -- Finalized NACTS software design (NSP)
 - -- Initiated system integration and factory testing (NSP)
 - -- Completed prototype flight testing (NSP)
 - -- Initiate weapons simulation integration efforts (NSP)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604735F Combat Training Ranges	2286
<ul style="list-style-type: none"> - (U) \$707 Began interoperability improvements with the Navy to include software upgrades and weapons simulations - (U) \$372 Began advanced threat development effort - (U) \$1,521 Continued AMODSM development with the Navy. - (U) \$808 Continued development and support of interface between ACTS (Air Combat Training System) programs and Air Force platforms <ul style="list-style-type: none"> - -- Established interface agreements for F-16A/B, F-16 Block 30, A-10, and B-52 (NSP) - -- Continued Interface Control Working Group activities (NSP) - -- Established Interface Memorandum of Agreement (MOA) with OO-ALC for F-16 Block 30, and F-16A/B (NSP) - -- Established MOA with SM-ALC for A-10 (NSP) - -- Established MOA with OC-ALC for B-52 (NSP) - -- Exercised interface contract option with Lockheed Martin and McDonnell Douglas (NSP) - -- Conducted Combined Interface Control Working Group and Technical Interchange meetings (NSP) - (U) \$2,179 Continued ASSET (ACTS Software Support Evaluation and Test) efforts to perform Air Combat Training Systems software baseline sustainment support for the airborne instrumentation systems for all Air Force configurations and Advanced Display Debriefing System (ADDS) for the joint services. - (U) \$2,500 Began efforts to ensure interoperability between the Navy's Joint Tactical Combat Training System (JTCTS) and Air Force unique requirements JTCTS Contractor: Raytheon, NJ (Navy Contract) - (U) \$5,164 Began EMD development of Alpena pod and ground system. - (U) \$26,490 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,751 Continue CTR basic operating support, and system acquisition and engineering support for range and threat systems - (U) \$4,705 Complete NACTS EMD <ul style="list-style-type: none"> - -- Complete and test final implementation of secure data link (NSP) - -- Complete system site installation, integration and testing (NSP) - -- Complete implementation of weapons simulation (NSP) - -- Achieve Initial Operational Capability (IOC) (unencrypted) April 98 (preliminary date, final IOC date to be negotiated) (NSP) - (U) \$1,995 Continue interoperability improvements with existing Navy ranges to include software upgrades and weapons simulation development - (U) \$941 Continue development of aircraft interfaces with aircraft/Pod integration for range applications with aircraft program offices and aircraft manufactures - (U) \$5,175 Continue advanced threat system development effort - (U) \$1,623 Continue ASSET efforts - (U) \$941 Complete Alpena EMD 		
Project 2286	Page 2 of 8 Pages	Exhibit R-2 (PE 0604735F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604735F Combat Training Ranges	PROJECT 2286																																																							
<p>– (U) \$19,131 Total</p> <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$3,061 Continue CTR basic operating support, and system acquisition and engineering support for range and threat systems – (U) \$3,080 Continue interoperability improvements with existing Air Force and Navy ranges to include software, upgrades, and weapons simulation development – (U) \$1,080 Continue development of aircraft interfaces with aircraft/Pod integration for range applications with aircraft program offices – (U) \$4,880 Continue advanced threat system development effort – (U) \$1,880 Continue ASSET efforts – (U) \$600 Begin development of software for proof of concept prototype demo of AN/MSR-T4 Enhanced Electronic Countermeasures (ECM) Environment Analysis Capability (TURBO TRAINS) – (U) \$14,581 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (1998 PB)</td> <td style="text-align: center;">21,926</td> <td style="text-align: center;">20,331</td> <td style="text-align: center;">14,875</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">23,018</td> <td style="text-align: center;">20,331</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Reductions</td> <td style="text-align: center;">-517</td> <td style="text-align: center;">-690</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: center;">-575</td> <td style="text-align: center;">-510</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td style="text-align: center;">+4,600</td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td style="text-align: center;">-36</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-294</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/ FY 1999 President's Budget</td> <td style="text-align: center;">26,490</td> <td style="text-align: center;">19,131</td> <td style="text-align: center;">14,581</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: Increase in FY97 was to support Alpena EMD Decrease in FY97 was due to the rescission to fund Bosnia supplemental Decrease in FY99 is inflation adjustment</p> <p style="padding-left: 20px;">Schedule: None</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (1998 PB)	21,926	20,331	14,875	TBD	(U) Appropriated Value	23,018	20,331			(U) Adjustments to Appropriated Value					a. Cong Reductions	-517	-690			b. SBIR	-575	-510			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	+4,600				e. Rescissions	-36				(U) Adjustments to Budget Years Since FY 1998 PB			-294		(U) Current Budget Submit/ FY 1999 President's Budget	26,490	19,131	14,581	TBD
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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Project 2286	Page 3 of 8 Pages	Exhibit R-2 (PE 0604735F)																																																							

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604735F Combat Training Ranges				PROJECT 2286	
Technical: None									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To Compl	Total Cost
(U) PE27429F: Appropriation: Other Procurement, AF (OPAF) Budget Activity: OPAF/Electronics & Telecommunications Equipment, Program Title : Combat Training Ranges	12,252	15,713	15,017	19,029	33,502	31,190	30,443	Cont	TBD
(U) PE27429F: Appropriation: Aircraft Procurement, AF (APAF) Budget Activity: APAF/Other Procurement Charges, Program Title: Combat Training Ranges	16,512	9,771	3,955	18,395	20,094	20,465	20,909	Cont	TBD
(U) D. <u>Schedule Profile</u>									
	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1
(U) Nellis Air Combat Training System (NACTS)									
(U) Final Design Review		*							
(U) Complete System Integration and Factory Test					X				
(U) Complete Site Installation						X			
(U) Site Acceptance Testing							X		
(U) System Turnover Activity								X	
(U) IOC									X
(U) Advances Threats Development									
(U) Initiate New Acquisition		*							
Project 2286		Page 4 of 8 Pages				Exhibit R-2 (PE 0604735F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998						
BUDGET ACTIVITY						PE NUMBER AND TITLE						PROJECT					
5 - Engineering and Manufacturing Development						0604735F Combat Training Ranges						2286					
		<u>FY 1997</u>						<u>FY 1998</u>						<u>FY 1999</u>			
		1	2	3	4	1	2	3	4	1	2	3	4				
(U) Contract Award							X										
(U) Joint Service Range Software Interoperability																	
(U) New Block Upgrade (Ongoing)		*	*				X										
(U) New Block Upgrade Installation and Checkout (Ongoing)			*	*	*	*	X										
(U) Advanced Message Oriented Data Security Module (AMODSM)																	
(U) Deliver Engineering Development Models (EMDs) (2 - Prototypes)			*														
(U) Exercise Production Options							X										
(U) Deliver Production Units										X							
(U) Aircraft/Pod Interface Development																	
(U) F-16 Block 40 & 50 Interface Contract		*	*	*	*	*	X										
(U) F-15 Interface Contract		*	*	*	*	*	X										
(U) Initiate Combined Interface Control Working Group		*	*	*	*	*	X										
(U) Establish Interface MOA w/OO-ALC			*	*	*	*	X										
(U) Establish Interface MOA w/SM-ALC				*	*	*	X										
(U) Establish Interface MOA w/OC-ALC					*	*	X										
(U) ASSET Facility																	
(U) Contract Award/Option						*											
(U) New Contract Award										X							

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604735F Combat Training Ranges			PROJECT 2286			
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U)	Nellis Air Combat Training System (NACTS)			9,208	4,705	0				
(U)	Advanced Message Oriented Data Security Module (AMODSM)			1,521	0	0				
(U)	Aircraft Interface Development			808	941	1,080				
(U)	Advanced Threat Development			372	5,175	4,880				
(U)	Joint Service Interoperability Improvements			707	1,995	3,080				
(U)	ASSET Efforts			2,179	1,623	1,880				
(U)	JTCTS Interoperabilty Efforts			2,500	0	0				
(U)	Enhanced ECM Environment Analysis Capability			0	0	600				
(U)	Combat Training Ranges Program Office Support			4,031	3,751	3,061				
(U)	Alpena			5,164	941	0				
(U)	Total			26,490	19,131	14,581				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Cubic Defense (NACTS)	C/CPAF/FFP	Mar 95			17,586	8,870	4,705	0	0	31,161
Raytheon (JTCTS)	Navy Contr	Mar 95			0	2,500	0	0	0	2,500
Project 2286										
Page 6 of 8 Pages										
Exhibit R-3 (PE 0604735F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604735F Combat Training Ranges					PROJECT 2286
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Lockheed Martin (AMODSM)	Navy Contr	FY 95			2,566	1,095	0	0	0	3,661
ASI (ASSET) Advanced Threats (Contractor TBD)	S/CPAF Unknown	Sep 96 Jan 98			350 0	182 0	700 5,175	1,000 5,000	Cont Cont	TBD TBD
Joint Interoperability Aircraft Interface	Navy Contract Through MOAs with ALCs & Aircraft SPO Contractors	Mar 97 Jun 96			0 412	618 272	650 456	1,200 1,200	Cont Cont	TBD TBD
Alpena (Contractor TBD)	FPIF	Feb 98			0	4,764	800	0	Cont	TBD
<u>Support and Management Organizations</u>										
ASC/WMR, Eglin AFB, FL	Various				4,887	5,914	5,475	5,011	Cont	TBD
NAWC, China Lake, CA	Various				0	1,935	870	870	Cont	TBD
<u>Test and Evaluation Organizations</u>										
ASC/WMR, Eglin AFB, FL	Various				1,405	100	100	100	Cont	TBD
46 Test Wing, Eglin AFB, FL	Various				640	240	200	200	Cont	TBD
Total Project					27,841	26,490	19,131	14,581	Cont	TBD

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604735F Combat Training Ranges	PROJECT 2286
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: NA

Subtotal Product Development	20,914	18,301	12,486	8,400	Cont	TBD
Subtotal Support and Management	4,887	7,849	6,345	5,881	Cont	TBD
Subtotal Test and Evaluation	2,040	340	300	300	Cont	TBD
Total Project	27,841	26,490	19,131	14,581	Cont	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604740F Computer Resources Management Technology
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	1,805	4,157	200	0	0	0	0	0	19,746
2522 Advanced Computer Technology Transition	1,226	676	0	0	0	0	0	0	5,607
2523 Architectural Implementation	579	684	200	0	0	0	0	0	3,443
2524 Reuse and Component Support	0	2,797	0	0	0	0	0	0	10,696
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

A major restructuring of this program into an Air Force Product Lines (AFPL) program is currently in process. As part of this, Project 2522 will be merged and funding will transition to Project 2523, to be renamed Product Line Implementation, during the FY 2000 Program Objective Memorandum (POM). The AFPL program dramatically reduces the development time, costs, and risks associated with the acquisition and development of warfighting command and control (C2) systems by using families of pre-defined product lines. The use of product line designs during program development improves the quality of computer systems and reduces overall life cycle costs. These improvements are implemented through Project 2523, the Command and Control Product Lines (CCPL) program and Project 2524, the Comprehensive Approach to Reusable Defense Software (CARDS) program. CCPL minimizes development cost and time by using pre-defined product line architectures with tested, reusable software components from mature programs. CARDS identifies, tests, and provides reusable software components and products to the CCPL program. CARDS developed a software reuse strategy for the DoD; and is developing a Product Line Asset Center Software Reuse Repository to manage a command center product line based on primarily commercial off-the-shelf (COTS) products. This initiative has determined that over 80% of the functionality of any command center software is common to all command centers. For seven programs using product line concepts, average savings of 56% in development costs and 66% in development time can be realized. CCPL transitions the R&D concept to the operational world and provides additional product lines. This program is in budget activity 5 - Engineering and Manufacturing Development, due to the developmental nature of the effort.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition, with the exception of STI, which was awarded under a sole source procurement.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		PE NUMBER AND TITLE 0604740F Computer Resources Management Technology		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	1,862	1,459	1,485	21,333
(U) Appropriated Value	1,956	4,459		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-5	-146		
b. SBIR	-48	-156		
c. Omnibus or Other Above Threshold Reprogramming				
d. Below Threshold Reprogramming	-54			
e. Rescissions	-44			
(U) Adjustments to Budget Years Since FY 1998 PB			-1,285	
(U) Current Budget Submit/FY 1999 President's Budget	1,805	4,157	200	19,746
 (U) Change Summary Explanation:				
<p>Funding: Congress added \$3.0 million to the FY 98 budget for the Comprehensive Approach to Reusable Defense Software (CARDS) program (project 2524). As a result of higher Air Force priorities, FY 99 and outyear funding was reduced/eliminated. As a result, The Computer Resources Management Technology program is being restructured to support development of an Air Force Product Lines (AFPL) program as part of the FY 2000 POM effort.</p> <p>Schedule: See above.</p> <p>Technical: See above.</p>				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
Not applicable.				
 (U) D. <u>Schedule Profile:</u>				
See individual projects.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604740F Computer Resources Management Technology	PROJECT 2522
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2522 Advanced Computer Technology Transition	1,226	676	0	0	0	0	0	0	5,607

(U) A. Mission Description and Budget Item Justification
 This project conducts research to improve support of embedded computer system software. It encompasses automation and standardization of support processes, advanced support methodologies, tools and environments, and readiness support to facilitate rapid turnaround of software in response to changing mission and/or changing threat requirements. As part of a major restructuring of this program, this project will be terminated after FY 98. This program is in budget activity 5 - Engineering and Manufacturing Development, due to the developmental nature of the effort.

(U) Acquisition Strategy:
 All major contracts within this Program Element were awarded after full and open competition.

- (U) FY 1997 (\$ in Thousands):**
- (U) \$361 Continued development of technology transition infrastructure within the Air Force
 - (U) \$114 Continued funding of Joint Logistics Commanders activities in software re-engineering and modernization of obsolescent, expensive software.
 - (U) \$751 Improved and continued to implement Air Force-wide metrics repository.
 - (U) \$1,226 Total

- (U) FY 1998 (\$ in Thousands):**
- (U) \$676 Funding will be merged with Project 2523 as part of the restructuring of this program (see page 1) to develop architecture for CCPL.
 - (U) \$676 Total

- (U) FY 1999 (\$ in Thousands):**
 Project 2522 transitioned to Project 2523 in FY 98.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604740F Computer Resources Management Technology		PROJECT 2522	
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	1,228	725	698	6,354
(U) Appropriated Value	1,228	725		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions		-24		
b. SBIR		-25		
c. Omnibus or Other Above Threshold Reprogramming				
d. Below Threshold Reprogramming	-2			
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-698	
(U) Current Budget Submit/FY 1999 President's Budget	1,226	676	0	5,607
 (U) Change Summary Explanation:				
Funding: Program is being merged with Project 2523 as part of the Command and Control Product Lines (see page 1).				
Schedule: See above.				
Technical: See above.				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands):</u>				
Not applicable.				
 (U) D. <u>Schedule Profile</u>				
Not applicable.				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604740F Computer Resources Management Technology					PROJECT 2522	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget FY 2000	Budget to Complete	Total Program
<u>Product Development Organizations</u>											
Universal SCA	CP	Dec 94	N/A	N/A	75	0	0	0	0	0	75
AGCS	CP	Jan 95	N/A	N/A	50	0	0	0	0	0	50
Martin Marietta	FFP	22 Oct 94	N/A	N/A	213	0	0	0	0	0	213
Hughes Aircraft	CPFF	19 Dec 92	N/A	N/A	282	287	220	0	0	0	789
Raytheon Co.	CPFF	19 Dec 92	N/A	N/A	891	361	200	0	0	0	1,452
Unisys	CPFF	29 Sep 93	N/A	N/A	660	0	0	0	0	0	660
TRW	CPFF	20 Feb 97	N/A	N/A	0	22	256	0	0	0	278
Lockheed Martin	CP	Var	N/A	N/A	0	100	0	0	0	0	100
<u>Support and Management Organizations</u>											
OO-ALC	N/A	Var	N/A	N/A	157	0	0	0	0	0	157
SENCOM	N/A	Jan 95	N/A	N/A	25	0	0	0	0	0	25
MOSAIC (TEMS)	CP	Jan 95	N/A	N/A	415	0	0	0	0	0	415
JLC	N/A	Var	N/A	N/A	230	0	0	0	0	0	230
SEI	FFRDC	Var	N/A	N/A	185	0	0	0	0	0	185
Sterling	N/A	Var	N/A	N/A	0	100	0	0	0	0	100
ATTI	N/A	Var	N/A	N/A	0	73	0	0	0	0	73
ESC	N/A	N/A	N/A	N/A	522	283	0	0	0	0	805
Project 2522			Page 6 of 15 Pages					Exhibit R-3 (PE 0604740F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604740F Computer Resources Management Technology					PROJECT 2522	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget FY 2000	Budget to Complete	Total Program
<u>Test and Evaluation Organizations</u>											
Not applicable.											
Subtotal Product Development					2,171	770	676	0	0	0	3,617
Subtotal Support and Management					1,534	456	0	0	0	0	1,990
Subtotal Test and Evaluation					0	0	0	0	0	0	0
Total Project					3,705	1,226	676	0	0	0	5,607

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604740F Computer Resources Management Technology	PROJECT 2523
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2523 Architectural Implementation	579	684	200	0	0	0	0	0	3,443

(U) A. Mission Description and Budget Item Justification
 As part of the restructuring of this program (see page 1), this project is being renamed Command and Control Product Lines (CCPL). The CCPL program provides pre-defined product line architectures with tested, reusable software components to build Command and Control (C2) systems. Using rapid prototyping techniques, a CCPL contractor can quickly tailor a product line to the warfighter's needs and deliver an integrated, combat-ready system. All product lines and components are based on Defense Information Infrastructure Common Operating Environment (DII COE) principles; make maximum use of open system architectures, industry standards, Commercial Off-the Shelf (COTS) products, and government furnished equipment; and incorporate multilevel security (MLS) features. CCPL minimizes development risks by reusing proven software components from mature programs and by continuously testing new products and technologies against the product line designs to ensure integration and interoperability. The CCPL contractors develop and maintain the C2 product line infrastructure in a collaborative, synergistic environment using validated, mature software engineering processes to help ensure the quality of the designs and components. Proven product line designs and tested software components reduce development costs, risks, and time for the user. New technologies, capabilities, and incremental developments are assessed and integrated into the designs as part of the product line development process to minimize any impact to the user. This program is in budget activity 5 - Engineering and Manufacturing Development, due to the developmental nature of the effort.

(U) Acquisition Strategy:
 All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997 (\$ in Thousands):

- (U) \$229 Developed architecture for Command and Control Product Line (CCPL)
- (U) \$200 Qualified components for CCPL.
- (U) \$150 Integrate products into CCPL
- (U) \$579 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$340 Qualify components for CCPL.
- (U) \$344 Integrate products into CCPL
- (U) \$684 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998																																																								
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604740F Computer Resources Management Technology		PROJECT 2523																																																								
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$200 Qualify components for CCPL. - (U) \$200 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">634</td> <td style="text-align: center;">734</td> <td style="text-align: center;">787</td> <td style="text-align: center;">4,080</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">634</td> <td style="text-align: center;">734</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional/General Reductions</td> <td></td> <td style="text-align: center;">-24</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td style="text-align: center;">-26</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: center;">-52</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: center;">-3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-587</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">579</td> <td style="text-align: center;">684</td> <td style="text-align: center;">200</td> <td style="text-align: center;">3,443</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <ul style="list-style-type: none"> Funding: See above Schedule: See above. Technical: See above. <p>(U) <u>C. Other Program Funding Summary (\$ in Thousands)</u> Not applicable</p> <p>(U) <u>D. Schedule Profile</u> Not applicable</p>						<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	634	734	787	4,080	(U) Appropriated Value	634	734			(U) Adjustments to Appropriated Value					a. Congressional/General Reductions		-24			b. SBIR		-26			c. Omnibus or Other Above Threshold Reprogramming					d. Below Threshold Reprogramming	-52				e. Rescissions	-3				(U) Adjustments to Budget Years Since FY 1998 PB			-587		(U) Current Budget Submit/FY 1999 President's Budget	579	684	200	3,443
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																							
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Project 2523		Page 9 of 15 Pages		Exhibit R-2 (PE 0604740F)																																																							

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604740F Computer Resources Management Technology			PROJECT 2523		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Command and Control Product Line Architectural (CCPL) Development				229					
(U)	CCPL Component Qualification				200	340	200			
(U)	CCPL Product Integration				150	344				
(U)	Total				579	684	200			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Hughes	CPFF	19 Dec 92	N/A	N/A	453	300	458	67	0	1,278
Raytheon	CPFF	19 Dec 92	N/A	N/A	1,000	100	0	66	0	1,166
AGCS	CPFF	Dec 94	N/A	N/A	50	0		0	0	50
TRW	CPFF	12 Feb 97	N/A	N/A	0	100	190	67	0	357
Unisys	CPFF	29 Sep 93	N/A	N/A	30	0	0	0	0	30
<u>Support and Management Organizations</u>										
MOSAIC (TEMS)	N/A	Var	N/A	N/A	178	0	0	0	0	178
ATTI	N/A	Var	N/A	N/A	22	0	0	0	0	22
ESC	N/A	N/A	N/A	N/A	247	79	36	0	0	362
<u>Test and Evaluation Organizations</u>										
Not applicable.										
Project 2523					Page 10 of 15 Pages			Exhibit R-3 (PE 0604740F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE
BUDGET ACTIVITY						February 1998
5 - Engineering and Manufacturing Development			PE NUMBER AND TITLE			PROJECT
			0604740F Computer Resources Management			2523
			Technology			
Government Furnished Property:						
Not applicable.						
Subtotal Product Development	1,533	500	648	200	0	2,881
Subtotal Support and Management	447	79	36	0	0	562
Subtotal Test and Evaluation						
Total Project	1,980	579	684	200	0	3,443

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604740F Computer Resources Management Technology				PROJECT 2524		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2524 Reuse and Component Support	0	2,797	0	0	0	0	0	0	10,696	
<p>(U) A. <u>Mission Description and Budget Item Justification</u> This project will be renamed the Central Archive for Reusable Defense Software (CARDS) program. CARDS develops a reuse blueprint for DoD and establishes a reuse library. CARDS is a Congressional special interest item for which Congress added funds in FY 1998. CARDS identifies, tests, and provides reusable software components and products to the CCPL program. CARDS developed a software reuse strategy for the DoD; and is developing a Product Line Asset Center Software Reuse Repository to manage a command center product line based on primarily on commercial off-the-shelf (COTS) products. This program is in budget activity 5 - Engineering and Manufacturing Development, due to the developmental nature of the effort.</p> <p>(U) <u>Acquisition Strategy:</u> All major contracts within this Program Element were awarded after full and open competition.</p> <p>(U) <u>FY 1997</u> Not applicable.</p> <p>(U) <u>FY 1998</u></p> <ul style="list-style-type: none"> - (U) \$440 Identify Enterprise Wide Assets (From COTS, GOTS, Product line engineering centers) - (U) \$2060 Perform suitability testing against product line architectures, assets, criteria and design - (U) \$297 Maintain repository/distribute product line architecture, assets, criteria and design - (U) \$2,797 Total <p>(U) <u>FY 1999</u></p> <ul style="list-style-type: none"> - (U) \$0 Total 										
Project 2524			Page 12 of 15 Pages				Exhibit R-2 (PE 0604740F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604740F Computer Resources Management Technology		PROJECT 2524	
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	0	0	0	10,899
(U) Appropriated Value	0	3,000		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions		-98		
b. SBIR		-105		
c. Omnibus or Other Above Threshold Reprogramming				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) Current Budget Submit/FY 1999 President's Budget	0	2,797	0	10,696
 (U) Change Summary Explanation:				
Funding: Congress added \$3.0 million to the FY 98 budget for the Comprehensive Approach to Reusable Defense Software (CARDS) program.				
Schedule: See above.				
Technical: See above.				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
Not applicable.				
 (U) D. <u>Schedule Profile</u>				
Not applicable.				
 Project 2524				
Page 13 of 15 Pages				
Exhibit R-2 (PE 0604740F)				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604740F Computer Resources Management Technology					PROJECT 2524	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>											
					<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>		<u>FY 2000</u>
(U)	Identify Enterprise Wide Assets						440				
(U)	Perform Suitability Testing						2,060				
(U)	Maintain Repository/Distribute Product Line						297				
(U)	Total						2,797				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget FY 2000	Budget to Complete	Total Program
<u>Product Development Organizations</u>											
Lockheed Martin	CPFF	May 97	N/A	N/A	0	0	330	0	0	0	330
<u>Support and Management Organizations</u>											
Unisys	CPFF	29 Sep 93	N/A	N/A	5,638	0	0	0	0	0	5,638
AGCS	CR	Dec 94	N/A	N/A	270	0	0	0	0	0	270
WVA High Tech	NPLACE	18 Nov 96	N/A	N/A	1,700	0	2,060	0	0	0	3,760
Raytheon/Hughes	CPFF	19 Dec 92	N/A	N/A	38	0	407	0	0	0	445
ATTI	N/A	N/A	N/A	N/A	253	0	0	0	0	0	253
<u>Test and Evaluation Organizations</u>											
Not applicable.											
Project 2524					Page 14 of 15 Pages				Exhibit R-3 (PE 0604740F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604740F Computer Resources Management Technology	PROJECT 2524

(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property:

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget FY 2000</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				0	0	330	0	0	0	330
Subtotal Support and Management				7,899	0	2,467	0	0	0	10,366
Subtotal Test and Evaluation				0	0	0	0	0	0	0
Total Project				7,899	0	2,797	0	0	0	10,696

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604750F Intelligence Equipment	PROJECT 2053
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2053 National Air Intel Center	1,013	1,223	1,300	1,369	1,336	1,353	1,379	Cont	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Intelligence Equipment (IE) provides continuing development and upgrades of threat analysis capabilities of the National Air Intelligence Center (NAIC) and Air Force Information Warfare Center (AFIWC). Both organizations are tasked with providing detailed foreign technology intelligence information to a variety of both DOD and non-DOD customers. In the past few years, customers' requirements have been more sophisticated, dictating more detailed and timely intelligence not only in the technology regime but also in the economic, world crisis, and political arenas. IE provides NAIC and AFIWC with the tools necessary to produce timely intelligence of foreign weapon systems and develops the tools to model and assess foreign airborne and aerospace systems. This is the only AF program developing new, or upgraded analysis, modeling and simulation tools focused on intelligence production in support of AF developmental and operational functions. This effort is Budget Activity 5, Engineering & Manufacturing Development, because the program develops and inserts new technology into existing systems and models to keep existing systems current.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 180 Continued Model Synthesis Interface.
- (U) \$ 215 Completed Low Observables Design Synthesis Tools (LODST) Upgrades for UAV
- (U) \$ 180 Initiated Advanced Communication Network Modeling
- (U) \$ 164 Initiated RF Weapons Modeling
- (U) \$ 274 Initiated Advanced Infrared Countermeasures Assessment
- (U) \$1,013 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604750F Intelligence Equipment	PROJECT 2053																																																		
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 180 Complete Model Synthesis Interface. - (U) \$ 421 Continue Advanced Communication Network Modeling - (U) \$ 351 Continue RF Weapons Modeling - (U) \$ 271 Complete Advanced Infrared Countermeasures Assessment - (U) \$1,223 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 425 Complete Advanced Communication Network Modeling - (U) \$ 244 Complete RF Weapons Modeling - (U) \$ 316 Initiate Foreign C3I Simulation (FoCIS) - (U) \$ 315 Initiate Electromagnetic Counter Measures Modeling - (U) \$1,300 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998)</td> <td style="text-align: center;">1,167</td> <td style="text-align: center;">1,287</td> <td style="text-align: center;">1,326</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">1,211</td> <td style="text-align: center;">1,287</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Reductions</td> <td style="text-align: center;">(25)</td> <td style="text-align: center;">(42)</td> <td></td> <td></td> </tr> <tr> <td> b. Small Business Innovative Research (SBIR)</td> <td style="text-align: center;">(19)</td> <td style="text-align: center;">(22)</td> <td></td> <td></td> </tr> <tr> <td> c. Below Threshold Reprogramming (BTR)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Rescissions</td> <td style="text-align: center;">(154)</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustment to Budget Years Since FY1998 PB</td> <td></td> <td></td> <td style="text-align: center;">(26)</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY1999 President's Budget</td> <td style="text-align: center;">1,013</td> <td style="text-align: center;">1,223</td> <td style="text-align: center;">1,300</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: None. Schedule: None Technical: None.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY1998)	1,167	1,287	1,326	TBD	(U) Appropriated Value	1,211	1,287			(U) Adjustments to Appropriated Value					a. Cong Reductions	(25)	(42)			b. Small Business Innovative Research (SBIR)	(19)	(22)			c. Below Threshold Reprogramming (BTR)					d. Rescissions	(154)				(U) Adjustment to Budget Years Since FY1998 PB			(26)		(U) Current Budget Submit/FY1999 President's Budget	1,013	1,223	1,300	TBD
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY1999</u>	<u>Total Cost</u>																																																
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Project 2053	Page 2 of 6 Pages	Exhibit R-2 (PE 0604750F)																																																		

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604750F Intelligence Equipment	PROJECT 2053
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(U) **C. Other Program Funding Summary (\$ in Thousands)**

(U) None.

(U) RELATED ACTIVITIES—None.

(U) **D. Schedule Profile**

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
1	2	3	4	1	2	3	4	1	2	3	4	
(U) Model Synthesis Interface								X				
(U) Air Surveillance C3 - web based simulation	X											
(U) Low Observables Design Synthesis Tools Upgrades for UAVs			X									
(U) Advanced Communication Network Modeling											X	
(U) Radio Frequency Weapons Modeling										X		
(U) Advanced Infrared Countermeasures Assessment				X								
(U) Foreign C3I Simulation (FoCIS)										X		
(U) Electromagnetic Counter Measures Modeling										X		
(U) Advanced IRCM Systems Assessment Model (AIRSAM)												
(U) Electromagnetic Antenna Modeling												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604750F Intelligence Equipment	PROJECT 2053
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Model Synthesis Interface	180	180	
(U) Low Observables Design Synthesis Tools Upgrades for UAVs	215		
(U) Advanced Communication Network Modeling	180	421	425
(U) Radio Frequency Weapons Modeling	164	351	244
(U) Advanced Infrared Countermeasures Assessment	274	271	
(U) Foreign C3I Simulation (FoCIS)			316
(U) Electromagnetic Counter Measures Modeling			315
(U) Advanced IRCM Systems Assessment Model (AIRSAM)			
(U) Electromagnetic Antenna Modeling			
(U) Total	1,013	1,223	1,300

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604750F Intelligence Equipment			PROJECT 2053		
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
GRCI	CPFF	30 Sep 93			563	120	120	0	0	803
93-C-0261/0										
McDonnell Douglas F33657-94-D-2277		8 May 97			304	225	0	0	Cont.	TBD
GRCI	CPFF	31 May 97			7	139	379	0	0	575
93-C-0261/25										
Harris Corp	CPFF	15 May 97				225	220	0	Cont.	TBD
94-D-0055/10										
Applied Science Lab 97-C-0036	CPFF	16 Jul 97				100	300	221	Cont.	TBD
Contractor TBD								887	Cont.	TBD
Rome Laboratory						204	204	192	Cont.	TBD
<u>Support and Management Organizations - N/A</u>										
<u>Test and Evaluation Organizations - N/A</u>										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604750F Intelligence Equipment	PROJECT 2053
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property:

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property - N/A</u>									
<u>Support and Management Property - N/A</u>									
<u>Test and Evaluation Property - N/A</u>									
Subtotal Product Development				874	1,013	1,223	1,300	Cont	TBD
Subtotal Support and Management				0	0	0	0		
Subtotal Test and Evaluation				0	0	0	0		
Total Project				874	1,013	1,223	1,300	Cont	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System	PROJECT P771
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
P771 JTIDS	29,127	7,374	7,956	8,863	8,989	9,116	9,439	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Joint Tactical Information Distribution System (JTIDS) is a communications component of the Tactical Digital Information Link (TADIL) designated Link-16, and is synonymous with the TADIL-J message standard. The Link-16 System provides the Air Force, Army, Navy, and Marine Corps Theater Command and Control (C2) elements, weapons platforms, and sensors with a secure, jam-resistant, high-capacity data link for use in a tactical combat environment. Link-16 permits rapid and secure exchange of essential C2 and status information through a network with all Link-16 terminals in the tactical theater.

The number of Air Force platforms hosting Link-16 is expanding, from C² aircraft (E-3, E-8, etc.) into the fighter, bomber, sensor, tanker, and other tactical fleets (F-15, F-16, RJ, ABCCC, B-2, B-52, etc.). Utilization of Link-16 in a joint environment requires the integration of terminals into these host platforms, and interoperability of Link-16 nets across all deployed joint and allied platforms. Integration encompasses hardware, software, operational, and logistics development activities for common platform requirements and for specific host platforms. Cross-platform activities include certification of individual Link-16 implementations to joint and allied standards, establishment of Service-wide net management procedures and operations, and test and sustainment activities.

This program is in budget activity 5 (Engineering Manufacturing and Development) because it supports development, integration and interoperability solutions, sustainment capabilities, and support of special projects.

(U) Acquisition Strategy

The JTIDS program office continues to manage the acquisition for the JTIDS family of terminals (Class 2/2H for the Air Force, Navy, and Marine Corps; Class 2M for the Army). Future acquisition of the Link 16 communications component (MIDS family) is now the responsibility of the Navy's Multifunctional Information Distribution System (MIDS) Joint International Program Office. Host platforms program and budget for JTIDS, MIDS (Fighter Data Link (FDL) and Low Volume Terminal derivatives) production terminals and for installation into operational units.

The Air Force Link 16 System Integration Office (SIO) provides for common development of integration and interoperability across all Air Force platforms and ensures that Link 16 is procured and maintained as a joint, end-to-end, command and control system.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		February 1998
PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System		PROJECT P771
<u>FY1997</u>	(\$ in thousands)	
- (U) 100	PROGRAMS: Efforts associated with Acquisition and Integration of Class 2/2H and Fighter Data Link. -- (U) Class 2/2H Terminals for E-3, E-8, F-15, RIVET JOINT, COBRA BALL, ABCCC, MAOC, and MCE platforms. -- (U) Command and Control (C2) Terminal Acquisition Support. --- Determined Terminal Technical and Configuration Requirements. --- Established delivery schedule. --- Coordinated Spare Requirements. --- Established Maintenance Plans. --- Established Maintenance Training Schedules.	
- (U) 24,423	INTEGRATION: Continued efforts associated with integration of terminals into the various platforms. -- (U) Ongoing integration support to AWACS, RIVET JOINT, ABCCC, MAOC, MCE, JSTARS, and F-22. -- (U) Technical Improvements: --- Technical support to AF Platforms to integrate Pre-Planned Product Improvements (P3I). --- Assisted in processing P3I efforts. -- (U) Field Support for F-15 Operations. --- Provided two SJSs to Nellis AFB. --- Supported flight training, exercises, and scenario development/demonstrations. --- Supported Data Link Utility Evaluation through Operational Special Project (OSP) and follow-on activities. --- Supported F-15 Electronic Combat Identification (CID) DT&E and Follow-on Activities. -- (U) Provided technical assistance to Boost Phase Intercept Programs. --- High Gear Program: Tested sensor tracking of Theater Missile. --- Airborne Interceptor: Established procedures for intercepting Theater Missile. -- (U) Purchased MIDS terminals for early integration, testing, and prototype activity. -- (U) Continued engineering studies for Link 16 into the F-16. -- (U) Began Link 16 engineering studies for platform development/upgrade on F-15. -- (U) Conducted Link 16 engineering studies on secondary platforms: Joint Stars, AWACS, ABCCC, Rivet Joint, AFMSS, A-10, and B-1. -- (U) Investigated approaches to implementing a modern, COTS-based, open systems architecture processor between Link 16 host system processors and Link 16 terminals through a generic interface processor study and demonstration.	
Project P771	Page 2 of 17 Pages	Exhibit R-2 (PE 0604754F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604754F Joint Tactical Information Distribution System	P771
<ul style="list-style-type: none"> - (U) 3,515 INTEROPERABILITY: Efforts associated with ensuring Link-16 operates effectively across all Host Platforms. <ul style="list-style-type: none"> -- (U) AF Platform Interoperability. <ul style="list-style-type: none"> --- Supported multi-service interoperability tests. --- Supported All Service Combat Identification Evaluation Team (ASCIET) tests. --- Supported to Engineering Interoperability Review Groups (IORGS US/UK bilateral). --- Supported definition of Link-16 network structures to support Interoperability. --- Developed Enhanced Position Location Radio System (EPLRS)/Link-16 gateway. -- (U) Network Support. <ul style="list-style-type: none"> --- Air Force Network Design. <ul style="list-style-type: none"> ---- Provided network design expertise. ---- Determined network design for integration testing. ---- Provided network design for integration testing. ---- Maintained AF network design aid for operations. ---- Evaluated Navy network design aid for Air Combat Command (ACC) users. --- Investigated internet-networking of JTIDS and transport control internet protocol networks. - (U) 200 SUSTAINMENT: Efforts associated with ensuring fielded terminals are supported. <ul style="list-style-type: none"> -- (U) ISSA technical engineering software support at Warner Robins AFB. -- (U) Maintained and upgraded the SJSs, Link-16 Winnebagos. -- (U) Maintained and upgraded the MULTI-LINK Translator and Display System (MTDS) prototype hardware. - (U) 889 TEST: Efforts associated with fielding terminals. <ul style="list-style-type: none"> -- (U) Support provided by the 46th Test Squadron. <ul style="list-style-type: none"> --- Software support. --- Platform integration support. --- Product improvement and special projects support. --- Regression test and integration. --- Product improvement/development support. - (U) \$ 29,127 TOTAL		
Project P771	Page 3 of 17 Pages	Exhibit R-2 (PE 0604754F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		February 1998
PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System		PROJECT P771
<p>– (U) FY1998 (\$ in thousands)</p> <p>JTIDS PROGRAMS: Efforts associated with Acquisition and Integration of Class 2/2H terminals</p> <p>– (U) 200 ACQUISITION SUPPORT</p> <ul style="list-style-type: none"> -- (U) Write, execute and administer contracts for E-3, E-8, F-15, F-22, AWACS, JSTARS, RIVET JOINT, ABCCC, MAOC and MCE platforms. -- (U) Command and Control Terminal Acquisition Support <ul style="list-style-type: none"> --- Determine technical and configuration requirements for existing and prospective platforms --- Establish hardware delivery schedules --- Establish maintenance plans --- Establish maintenance training schedules --- Coordinate spare requirements <p>– (U) 350 TECHNICAL SUPPORT</p> <ul style="list-style-type: none"> -- (U) Ongoing technical and programmatic support to for JTIDS users - AWACS, JSTARS, RIVET JOINT, ABCCC, MAOC MCE and F-22 platforms. -- (U) Technical Improvements: <ul style="list-style-type: none"> --- Technical support to AF platforms for the purpose of integrating Pre-Planned Product Improvements (P3I) --- Assist in executing P3I requirements -- (U) Assist in technical trouble shooting for platforms utilizing Class 2/2H terminals -- (U) Coordinate hardware availability and support equipment for interoperability certifications -- (U) Provide acquisition support to Time Slot Reallocation (TSR) software efforts -- (U) Manage Pre-Operational support of Class 2/2H hardware -- (U) Develop and coordinate terminal usage schedules for platforms developing JTIDS capability <p>– (U) 100 DIMINISHING MANUFACTURING RESOURCES</p> <ul style="list-style-type: none"> -- (U) Investigate Diminishing Manufacturing Sources <ul style="list-style-type: none"> --- Identify problem electronic parts --- Assess impacts to fielded hardware test support equipment --- Develop resolution plans 		
Project P771	Page 4 of 17 Pages	Exhibit R-2 (PE 0604754F)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		February 1998
PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System		PROJECT P771
<u>SYSTEM INTEGRATION</u>		
<ul style="list-style-type: none"> - (U) 3,246 LINK-16 INTEGRATION: Efforts associated with hardware and software integration of Link 16 terminals into Air Force platforms. <ul style="list-style-type: none"> -- (U) On-going engineering integration support to F-15C, AWACS, RIVET JOINT, ABCCC, MAOC, MCE, and JSTARS. -- (U) Engineering integration support. <ul style="list-style-type: none"> --- New platforms to include F-15E, F-16, F-22, B-1, B-2, B-52, A-10, F-117, and Joint Strike Fighter. --- Perform initial evaluation for new mission areas. --- Integration cost reduction initiatives for interface processor. -- (U) Technical Improvements: <ul style="list-style-type: none"> --- Technical support for integration of Class 2 terminal P3I efforts. --- Technical support and demos for Link 16 capacity enhancements. --- Support development of Joint VMF/Link-16 gateway. -- (U) Field Support. <ul style="list-style-type: none"> --- Support special exercises and tests. -- (U) Provide technical assistance to Link 16 Demonstration programs to include Project Strike (Link 16 delivery of information to support strikes on time critical targets). -- (U) Generic Integration/Common Operating Environment (COE) support. <ul style="list-style-type: none"> --- Integration cost reduction initiatives (Hardware/Software) across multiple platforms. --- Provide support to ASC2A in developing common operating picture --- Provide support in providing Link-16 capability (data in cockpit) for Expeditionary Force Experiment'98. 		
Project P771	Page 5 of 17 Pages	Exhibit R-2 (PE 0604754F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System	PROJECT P771
<p>– (U) 1,623</p>	<p>LINK-16 INTEROPERABILITY: Efforts associated with ensuring Link-16 operates effectively across all host platforms.</p> <ul style="list-style-type: none"> -- (U) Support CAF/Joint certification testing. -- (U) Support development of interoperability matrixes. -- (U) Support development of distributive interoperability testing initiatives. -- (U) Provide engineering support to interoperability working groups. (IORGS, US/UK bilateral, MIDS) -- (U) Support operational contingencies, multi-service operational tests, and exercises and evaluations (ASCIET, Roving Sands, Air Expeditionary Force Experiment, etc). -- (U) Network Support: <ul style="list-style-type: none"> --- Engineering Support to Air Force Network Design Facility <ul style="list-style-type: none"> ---- Provide network design engineering expertise and training. ---- Provide network design guidelines. --- Assist customers with network design problems. --- Evaluate/Develop Air Force and Joint Network Design Aids. -- (U) Communication Support: <ul style="list-style-type: none"> --- Evaluate/develop communications design aids, including tools for Joint Interface Control Officer/Service Interface Control Officer (JICO/SICO). --- Provide Engineering Support for Air Force Communications planning. -- (U) Crypto Support: <ul style="list-style-type: none"> --- Support Air Force Electronic Key Management Plan System support and joint key management plan development. --- Provide support to Joint Crypto working groups and planning efforts. -- Spectrum Support: <ul style="list-style-type: none"> --- Provide engineering support for Air Force Spectrum and Electromagnetic Compatibility (EMC) issues and tests. -- Link-16 Gateways/Interfaces: <ul style="list-style-type: none"> --- Interface to Various DII systems (GCCS). --- Interface via network protocols (TCP/IP, ATM, etc). --- Interface to Intel/COTS Products (NTM platforms). 	
Project P771	Page 6 of 17 Pages	Exhibit R-2 (PE 0604754F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604754F Joint Tactical Information Distribution System	P771
<p>– (U) 1,855 LINK-16 EMD SUPPORT: Efforts associated with fielding terminals.</p> <ul style="list-style-type: none">-- (U) Support Operations Support Working Groups.-- (U) Maintenance of Developmental Equipment:<ul style="list-style-type: none">--- Maintain and upgrade the SJS and Link-16 Winnebagos.--- Maintain suite of developmental terminals.--- Maintain and Upgrade the Multi-Link Translator and Display System (MTDS) prototype hardware and software.-- (U) Test Support:<ul style="list-style-type: none">--- Platform integration support.--- Special/Unique test support.--- Operational Link-16 problem investigation support.-- (U) Fielding/Non-Recurring Training:<ul style="list-style-type: none">-- Initial/non-recurring training support.-- Initial fielding support. <p>– (U) \$ 7,374 TOTAL</p>		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		February 1998
PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System		PROJECT P771
<p>– (U) FY1999 (\$ in thousands) JTIDS PROGRAMS: Efforts associated with Acquisition and Integration of Class 2/2H terminals</p> <p>– (U) 200 ACQUISITION SUPPORT</p> <ul style="list-style-type: none"> -- (U) Write, execute and administer contracts for E-3, E-8, F-15, F-22, AWACS, JSTARS, RIVET JOINT, ABCCC, MAOC and MCE platforms. -- (U) Command and Control Terminal Acquisition Support <ul style="list-style-type: none"> --- Determine technical and configuration requirements for existing and prospective platforms --- Establish hardware delivery schedules --- Establish maintenance plans --- Establish maintenance training schedules --- Coordinate spare requirements <p>– (U) 300 TECHNICAL SUPPORT</p> <ul style="list-style-type: none"> -- (U) Ongoing technical and programmatic support to for JTIDS users - AWACS, JSTARS, RIVET JOINT, ABCCC, MAOC MCE and F-22 platforms. -- (U) Technical Improvements: <ul style="list-style-type: none"> --- Technical support to AF platforms for the purpose of integrating Pre-Planned Product Improvements (P3I) --- Assist in executing P3I requirements -- (U) Assist in technical trouble shooting for platforms utilizing Class 2/2H terminals -- (U) Coordinate hardware availability and support equipment for interoperability certifications -- (U) Provide acquisition support to Time Slot Reallocation (TSR) software efforts -- (U) Manage Pre-Operational support of Class 2/2H hardware -- (U) Develop and coordinate terminal usage schedules for platforms developing JTIDS capability <p>– (U) 100 DIMINISHING MANUFACTURING RESOURCES</p> <ul style="list-style-type: none"> -- (U) Investigate Diminishing Manufacturing Sources <ul style="list-style-type: none"> --- Identify problem electronic parts --- Assess impacts to fielded hardware test support equipment --- Develop resolution plans 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development		February 1998
PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System		PROJECT P771
<p align="center"><u>SYSTEM INTEGRATION</u></p> <p>– (U) 3,578 LINK-16 INTEGRATION: Efforts associated with integration of Link 16 terminals into Air Force platforms.</p> <ul style="list-style-type: none"> -- (U) On-going engineering integration support to F-15C, AWACS, RIVET JOINT, ABCCC, MAOC, MCE, and JSTARS. -- (U) Engineering integration support. <ul style="list-style-type: none"> --- New platforms to include F-15E, F-16, F-22, B-1, B-2, B-52, A-10, F-117, and Joint Strike Fighter. --- Perform initial evaluation for new mission areas. --- Integration cost reduction initiatives for interface processor. -- (U) Technical Improvements: <ul style="list-style-type: none"> --- Technical support for integration of Class 2 terminal P3I efforts. --- Technical support and demos for Link 16 capacity enhancements. --- Support development of Joint VMF/Link-16 gateway. -- (U) Field Support. <ul style="list-style-type: none"> --- Support special exercises and tests. -- (U) Provide technical assistance to Link 16 Demonstration programs to include Project Strike (Link 16 delivery of information to support strikes on time critical targets). -- (U) Generic Integration/Common Operating Environment (COE) support. <ul style="list-style-type: none"> --- Integration cost reduction initiatives (Hardware/Software) across multiple platforms. --- Provide support to ASC2A in developing common operating picture --- Provide support in providing Link-16 capability (data in cockpit) for Expeditionary Force Experiment'98. 		
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System	PROJECT P771
<p>– (U) 1,735</p>	<p>LINK-16 INTEROPERABILITY: Efforts associated with ensuring Link-16 operates effectively across all host platforms.</p> <ul style="list-style-type: none"> -- (U) Support CAF/Joint certification testing. -- (U) Support development of interoperability matrixes. -- (U) Support development of distributive interoperability testing initiatives. -- (U) Provide engineering support to interoperability working groups. (IORGS, US/UK bilateral, MIDS) -- (U) Support operational contingencies, multi-service operational tests, and exercises and evaluations (ASCIET, Roving Sands, Air Expeditionary Force Experiment, etc). -- (U) Network Support: <ul style="list-style-type: none"> --- Engineering Support to Air Force Network Design Facility <ul style="list-style-type: none"> ---- Provide network design engineering expertise and training. ---- Provide network design guidelines. --- Assist customers with network design problems. --- Evaluate/Develop Air Force and Joint Network Design Aids. -- (U) Communication Support: <ul style="list-style-type: none"> --- Evaluate/develop communications design aids, including tools for Joint Interface Control Officer/Service Interface Control Officer (JICO/SICO). --- Provide Engineering Support for Air Force Communications planning. -- (U) Crypto Support: <ul style="list-style-type: none"> --- Support Air Force Electronic Key Management Plan System support and joint key management plan development. --- Provide support to Joint Crypto working groups and planning efforts. -- Spectrum Support: <ul style="list-style-type: none"> --- Provide engineering support for Air Force Spectrum and Electromagnetic Compatibility (EMC) issues and tests. -- Link-16 Gateways/Interfaces: <ul style="list-style-type: none"> --- Interface to Various DII systems (GCCS). --- Interface via network protocols (TCP/IP, ATM, etc). --- Interface to Intel/COTS Products (NTM platforms). 	
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604754F Joint Tactical Information Distribution System	P771
<p>– (U) 2,043 LINK-16 EMD SUPPORT: Efforts associated with fielding terminals.</p> <ul style="list-style-type: none">-- (U) Support Operations Support Working Groups.-- (U) Maintenance of Developmental Equipment:<ul style="list-style-type: none">--- Maintain and upgrade the SJS and Link-16 Winnebagos.--- Maintain suite of developmental terminals.--- Maintain and Upgrade the Multi-Link Translator and Display System (MTDS) prototype hardware and software.-- (U) Test Support:<ul style="list-style-type: none">--- Platform integration support.--- Special/Unique test support.--- Operational Link-16 problem investigation support.-- (U) Fielding/Non-Recurring Training:<ul style="list-style-type: none">-- Initial/non-recurring training support.-- Initial fielding support. <p>-- (U) \$ 7,956 TOTAL</p>		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System			PROJECT P771		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>					
(U) Previous President's Budget (FY 1998)	29,321	8,557	8,616	TBD					
(U) Appropriated Value	30,875	8,557							
(U) Adjustments to Appropriated Value									
a. General Congressional Reduction	-786	-991							
b. Small Business Innovative Research	-768	-192							
c. Omnibus and Other Above Threshold Reprogrammings									
d. Below Threshold Reprogrammings	-146								
e. Recissions	-48								
(U) Adjustments to Budget Years Since FY 1998 PB			-660						
(U) Current Budget Submit/FY 1999 President's Budget	29,127	7,374	7,956	TBD					
 (U) Change Summary Explanation:									
Funding: FY98 CGR and SBIR reductions (\$ -1,183) eliminates or significantly reduces specific platform support to the F-16, the Bombers and EFX exercise. Integration costs for these platforms expected to increase 25-50%. FY98 \$50K on withhold pending reprogramming for higher priorities. FY99 adjustment to fund other service priorities (-\$660K).									
Schedule: Above reductions put F-16 delivery schedule at risk, could slip two years based on operational flight program cycles and required deadlines.									
Technical: Eliminates B-1B, B-2, and B-52 generic integration solution work.									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>To</u> <u>Complete</u>	<u>Total</u> <u>Cost</u>	
(U) Other Proc AF, PE 27417F (AWACS), BA 7	16,100	3,400	300	0	0	0	0	50,900	
(U) Other Proc AF, PE 27581F (JSTARS), BA 7	0	0	0	0	0	0	0	15,800	
Project P771									
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System			PROJECT P771		
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	To <u>Complete</u>	Total <u>Cost</u>
(U) Other Proc AF, PE 27412F (MCE), BA 7		0	22,100	15,000	0	0	0	0	143,900
(U) Other Proc AF, PE 35154F (AIA), BA 7		3,400	4,800	4,900	5,000	5,700	0	0	33,300
- (U) <u>Related RDT&E:</u>									
(U)- Program Element 0604770F / 0207581F E-8 (Joint STARS)									
(U)- Program Element 0207417F E-3 (AWACS)									
(U)- Program Element 0207412F Modular Control Equipment (MCE)									
(U)- Program Element 0207419F Airborne Battlefield Command and Control Center (ABCCC)									
(U)- Program Element 0305154F AIA.									
(U) <u>D. Schedule Profile</u>									
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>	
	1	2	3	4	1	2	3	4	1
(U) Acquisition Milestones									
- Milestone III FRP 2M		X							
(U) T&E Milestones									
- F-15 OSP Complete				X					
- MCE IOT&E			X						
- MS OT-III	X								
- IOT&E Class 2M	X								
(U) FDL Testing									
- Initial Operational Assessment				X					
- QT&E/QOT&E Complete					X				
- Flight QOT&E Complete							X		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998			
BUDGET ACTIVITY						PE NUMBER AND TITLE						PROJECT		
5 - Engineering and Manufacturing Development						0604754F Joint Tactical Information Distribution System						P771		
		<u>FY 1997</u>					<u>FY 1998</u>					<u>FY 1999</u>		
		1	2	3	4	1	2	3	4	1	2	3	4	
(U) Contract Milestones														
- FRP Class 2M				X										
- FRP II			X											
- FDL Award	X													
- FDL Pilot Production Start						X								
- FDL Initial Rate Production										X				
- FDL Full Rate Production													X	
(U) Host Platform Integration Start														
- F-15E						X								
- F-16						X								
- F-22 (1992)														
- B-1 (FY00 POM)														
- B-2 (FY00 POM)														
- B-52 (FY00 POM)														
- A-10 (FY03)														
- F-117 (FY04)														
- Airborne Laser (ABL)						X								
(U) Command and Control Platforms														
- AWACS Link 16 Qual Complete													X	
- JSTARS														
Start Baseline Integration					X									
Complete Baseline Integration												X		
- RIVET JOINT														
First Install				X										
Complete (FY02)														
- ABCCC														
- MCE (P3I)														
Installation Start									X					
Installation Complete (FY00)														

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	
5 - Engineering and Manufacturing Development		February 1998	
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT	
5 - Engineering and Manufacturing Development	0604754F Joint Tactical Information Distribution System	P771	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Programs	100		
(U) Integration	24,423		
(U) Interoperability	3,515		
(U) Sustainment	200		
(U) Test	889		
(U) JTIDS PROGRAMS			
(U) Acquisition Support		200	200
(U) Technical Support		350	300
(U) Diminshing Manufacturing Resources		100	100
(U) SYSTEM INTEGRATION (Link 16)			
(U) Link-16 Integration		3,246	3,578
(U) Link-16 Interoperability		1,623	1,735
(U) EMD Activities		1,855	2,043
(U) TOTAL	29,127	7,374	7,956
NOTE 1: ESC reorganization resulted in a split between JTIDS and Link-16 efforts. Sustainment and parts of other efforts are now included under JTIDS PROGRAMS. The ongoing Link 16 integration functions are included under SYSTEM INTEGRATION. In future Descriptive Summaries, another BPAC will be used to facilitate separate tracking of the Link 16 SYSTEM INTEGRATION activities.			
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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System	PROJECT P771

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
GEC-MARCONI	FFP	DEC 85	80,727	80,727	80,527	200	0	0	0	80,727
LOCKHEED	FFP	JUN 93	6,761	6,761	4,661	2100	0	0	0	6,761
GEC-MARCONI	FFP	JUN 93	850	850	850	0	0	0	0	850
CACD	FFP	JUN 93	1,072	1,072	1,072	0	0	0	0	1,072
MCAIR	CPFF	MAR 94	2,434	2,434	2,434	0	0	0	0	2,434
RADC	PO/616	Various	Various	Various	2,867	200	0	0	0	3,067
WR-ALC	PO/616	Various	Various	Various	2,966	0	0	0	0	2,966
NADEP	MIPR	Various	Various	Various	795	0	235	0	0	1,030
ACSI	FFP	SEP 94	492	492	492	0	0	0	0	492
VIASAT, INC.	FFP	Various	815	815	0	815	0	0	0	815
AF Platforms	PO/616	Various	Various	Various	0	169	0	0	0	169
NORTHROP GR	FFP	AUG 97	500	500	0	500	0	0	0	500
ROCKWELL	FFP	Various	2,080	2,080	0	2,080	0	0	0	2,080
HUGHES	FFP	Various	133	133	0	133	0	0	0	133
DRC	FFP	MAY 97	213	213	0	213	0	0	0	213
MIDSCO, Inc	MIPR	Various	4,251	4,251	0	3,850	0			4,250
MOTOROLA INC	FFP	Various	1,800	1,800	0	1,800	0	0	0	1,800
ALLIED SIGNAL	CPFF	Various	75	75	0	75	0	0	0	75
MCDONNELL DG	FFP	Various	2,582	2,582	0	2,582	0	0	0	2,582
BOEING	FFP	Various	869	869	0	869	0	0	0	869

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604754F Joint Tactical Information Distribution System					PROJECT P771
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Support and Management Organizations</u>										
ESC	Various	Various	26,969	26,969	19,214	2,211	738	966	Continue	TBD
CONTRACTOR SUPPORT	Various	Various	52,457	52,457	39,765	2,783	855	1,440	Continue	TBD
MITRE	FPLOE	Various	89,900	89,900	77,340	7,619	4,546	4,550	Continue	TBD
<u>Test and Evaluation Organizations</u>										
MT HOME AFB	PO/616	Various	Various	Various	416					416
EGLIN AFB	PO/616	Various	Various	Various	826	928	1,000	1,000	Continue	TBD
Government Furnished Property: NOT APPLICABLE										
Subtotal Product Development					96,664	15,586	235	0	Continue	TBD
Subtotal Support and Management					136,319	12,613	6,139	6,956	Continue	TBD
Subtotal Test and Evaluation					1,242	928	1,000	1,000	Continue	TBD
Total Project					234,225	29,127	7,374	7,956	Continue	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604762F Common Low Observable Verification System (CLOVerS)	PROJECT 4683
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4683 Common Low Observable Verification System	0	0	4,901	2,440	972	0	0	0	8,313
Quantity of RDT&E Articles	0	0	0	0	1	0	0	0	1

(U) A. Mission Description and Budget Item Justification

Common Low Observable Verification System (CLOVerS) is intended as an easily deployable flightline system to evaluate surface anomalies on low observable (stealth) aircraft. It will allow maintenance personnel to determine if a repair is needed, or if the repair performed was successful in restoring the low observable characteristic of the aircraft. CLOVerS is intended for use with the B-2, F-117, F-22, as well as future aircraft such as the Joint Strike Fighter, and the Darkstar Unmanned Aerial Vehicle. Key capabilities required include the ability to detect, locate, and resolve small surface defects, reduced measurement time (compared to existing verification methods), operation under less restrictive security measures, and a small deployment footprint. This program is in budget activity 5 - Engineering and Manufacturing Development, Research Category 6.4 because this program develops the Common Low Observable Verification System (CLOVerS).

(U) Acquisition Strategy:

All major contracts within this program element will be awarded using full and open competition.

(U) FY 1999 (\$ in Thousands):

- (U) \$500 Initiate technical assessment and cost benefit analysis (CBA) of potential solutions.
- (U) \$200 Establish formal cost estimates based on CBA
- (U) \$3,901 Award risk reduction contracts
- (U) \$300 Program Office Support
- (U) \$4,901 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604762F Common Low Observable Verification System (CLOVerS)			PROJECT 4683		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>					
	0	0	0	<u>Cost</u>					
(U) Previous President's Budget	0	0	0	0					
(U) Appropriated Value									
(U) Adjustments to Appropriated Value									
a. Cong Reductions									
b. SBIR									
c. Omnibus or Other Above Threshold Reprogram									
d. Below Threshold Reprogramming									
(U) Adjustments to Budget Years Since FY 1998 PB	0	0	4,901	8,313					
(U) Current Budget Submit/ 1999 President's Budget	0	0	4,901	8,313					
 (U) Change Summary Explanation:									
Funding: CLOVerS is an FY99 new start									
Schedule: CLOVerS is an FY99 new start									
Technical: None									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) PE11127F:Appn: Aircraft Procurement, AF (APAF) Budget Activity: Aircraft (A/C) Procurement/Common Support Equipment, Program Title: Common Low Observable Test Equipment	0	0	0	0	1,458	2,807	1,446	Cont	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE **February 1998**

BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
0604762F Common Low Observable Verification System (CLOVerS)

PROJECT
4683

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Risk Reduction Contract Award										X		
(U) Cost Estimate Established											X	
(U) Tech Assessment/CBA Complete											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604762F Common Low Observable Verification System (CLOVerS)				PROJECT 4683	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Risk Reduction Contracts					0	0	3,901			
(U) EMD Preparation (CBA, Cost estimate establishment)							700			
(U) Program Office Support							300			
(U) Total							4,901			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
TBD					0	0	0	3,901	TBD	TBD
<u>Support and Management Organizations</u>										
ASC/SMD, WPAFB OH		Various			0	0	0	1,000	TBD	TBD
<u>Test and Evaluation Organizations</u>										
					0	0	0	0	TBD	TBD
Project 4683					Page 4 of 5 Pages			Exhibit R-3 (PE 0604762F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998	
BUDGET ACTIVITY			PE NUMBER AND TITLE			PROJECT	
5 - Engineering and Manufacturing Development			0604762F Common Low Observable Verification System (CLOVerS)			4683	
Government Furnished Property: None							
Subtotal Product Development	0	0	0	3,901	TBD	TBD	
Subtotal Support and Management	0	0	0	1,000	TBD	TBD	
Subtotal Test and Evaluation	0	0	0	0	TBD	TBD	
Total Project	0	0	0	4,901	3,412	8,313	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604779F Joint Interoperability Tactical Command/Control				PROJECT Project	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
JINTACCS	4,697	4,972	5,823	5,943	5,988	6,060	6,168	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification
 JINTACCS is a Joint Staff directed program for the development and maintenance of tactical information exchange configuration items (CIs) and operational procedures. This program enables and ensures tactical command and control (C2)/weapons systems to be interoperable within an Air Force (AF), a joint (two or more US services or agencies) or combined (US and allied) environment. The JINTACCS program includes: joint development, interoperability certification, message standard implementation, and configuration management (CM) of US Message Text Formatting (USMTF) CIs; joint development, interoperability certification, message standard implementation, and CM. Link 11A/B, 4, 16, etc. (TADILs A/B, C, J, etc.). Air Force JINTACCS complies with and satisfies DoD Directive 4630.5. Air Force JINTACCS supports participation with the Army, Navy, Marines, Air Intelligence Agency, CINC Bloc, Joint Interoperability and Engineering Organization (JIEO) which acts as the Executive Agent, Joint Interoperability Test Command (JITC), and allied/combined equivalents. CINC, Service and agency (C/S/A) activities are governed by Joint Chiefs of Staff (JCS) approved documentation including Technical Interface Concepts, Technical Interface Design Plans (TIDPs), Military Standards (MIL-STDs), CJCSMs, and CJCSIs, NATO Standard Agreements (STANAGs) and operating procedures (ADatPs). Close liaison across each of the Service JINTACCS programs precludes duplication of efforts. Air Force platforms/systems participating in this program include: AWACS; ABCCC; MCE; AOC; Joint STARS; F-15C/D; F-15E; F-16; F-22; RC-135; R/SOCC, CBRN; IADS; ASOC; and TACP. Air Force JINTACCS supports the Assistant Secretary of Defense (ASD) directive on harmonization of US and NATO messages (e.g., ATO and ACO), and fulfills the Link 16 General Officer Steering Group (GOSG – ASC2A/CC, AFPEO/FB, SAF/AQI, ACC/DR) direction to develop and manage the Air Force JINTACCS CM Plan for TADIL (LINK) and MTF Message Standards (AFJCMP-TMMS). The JINTACCS program, formerly Ground and Amphibious Military Operation (GAMO), is directed by JCS Memorandum 205-72, dated 1 April 1971, as modified by a Secretary of Defense memorandum, "Reorganization of the DoD Program to Achieve Interoperability of Tactical C2 Systems for GAMO," dated 2 Aug 1977. The program complies with requirements of DoD Directive 4630.5, "Compatibility, Interoperability, and Integration of Command, Control, Communications, and Intelligence (C3I) Systems," November 12, 1992, and DoD Instruction 4630.8, "Procedures for Compatibility, Interoperability, and Integration of C3I Systems," November 18, 1992. The JINTACCS program entails the compatibility and interoperability of C3 systems including tactical intelligence for joint or combined operations through the development and management of a joint architecture, tactical information exchange requirements process, interface definitions, message text formats (MTFs), Tactical Digital Information Links (TADILs), Variable Message Formats (VMF), and other combat data link standards. This includes the coordination of all combat data link and MTF certification testing and configuration management of message standard CIs under one program element. This project ensures C3/weapons system interoperability among all the CINCs, DoD agencies, and the services. Developmental certification testing is a pre-production requirement in accordance with DoDD 4630.5 and DoDI 4630.8. This program is in budget activity 5 - Engineering and Manufacturing Development, because it is designed to improve the interoperability of Tactical Command and Control (C2) Systems used in support of joint operations.

Project Project 1 Page 1 of 9 Pages Exhibit R-2 (PE 0604779F)

		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604779F Joint Interoperability Tactical Command/Control	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604779F Joint Interoperability Tactical Command/Control	PROJECT Project
<p>(U) Acquisition Strategy: As the Air Force lead agent for a jointly directed program, JINTACCS provides level of effort technical support for increasing interoperability of AF programs through message text and data link standards implementation.</p> <p>(U) FY 1997</p> <ul style="list-style-type: none"> - (U) \$ 72 Directed Technical support (contractor support). - (U) \$ 168 Began Joint testing of Iceland Air Defense System (IADS). - (U) \$ 155 Continued acquisition of JTIDS Test Device (JTD)/enhancements. - (U) \$ 100 Began development of follow-on automated test tools. - (U) \$ 100 Continued Combat Air Force (CAF) and Joint certification testing of Airborne Command Control Center (ABCCC). - (U) \$ 100 Continued CAF and Joint certification testing of E-3. - (U) \$ 100 Continued CAF and Joint testing of Regional Air Operations Center (RAOC)/AWACS Digital Information Link (RADIL). - (U) \$ 732 Message Text Standards Configuration Management (contractor support). - (U) \$ 277 NATO Message Text Standards configuration management. - (U) \$ 647 Future information exchange development efforts. - (U) \$ 60 Continued expansion of MTF certification testing to fielded systems. - (U) \$ 546 TADIL configuration management (contractor support). - (U) \$ 454 Link 16 Migration support (contractor support). - (U) \$ 286 TADIL configuration management (contractor support). - (U) \$ 300 Continued development of TADIL documentation on CD-ROM. - (U) \$ 100 Continued modification of message standards supporting Theater Missile Defense. - (U) \$ 200 Continued development of Digital Message Transfer Device (DMTD), Variable Message Format (VMF), and TADIL J capability. - (U) \$ 100 Continued network design and aids development for JTIDS network design facility and architecture. - (U) \$ 200 Started hardware/software integration for F-15E, F-16 Block 50/52, and RAOC/Sector Air Operations Center (SAOC). (U) \$ 4,697 Total 		
Project Project 1	Page 2 of 9 Pages	Exhibit R-2 (PE 0604779F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
5 - Engineering and Manufacturing Development	0604779F Joint Interoperability Tactical Command/Control	Project
<p>(U) <u>FY 1998</u></p> <ul style="list-style-type: none"> - (U) \$ 60 Direct technical support (contractor support). - (U) \$ 135 Continue CAF testing of JSTARS. - (U) \$ 135 Continue annual CAF and Joint certification testing requirements for IADS. - (U) \$ 85 Continue development of automated test tools. - (U) \$ 240 Continuing annual CAF and Joint certification testing requirements for E-3 Block 20/25/30/35, IADS and MCE (TADIL A, B, J). - (U) \$ 135 Begin annual CAF and Joint certification testing requirements for MCE P3I TADIL J/Link 16. - (U) \$ 60 Continuing annual CAF and Joint certification testing requirements for RADIL. - (U) \$ 135 Begin CAF and Joint certification testing for Senior Troupe (TADIL A, B). - (U) \$ 135 Begin CAF and Joint certification testing for Senior Scout (TADIL A). - (U) \$ 135 Begin CAF and Joint certification testing for Contingency Theater Air Planning System (CTAPS)/ Theater Battle Management and Control System (TBMCS). - (U) \$ 60 Begin CAF and Joint certification testing for ABCCC (TADIL J). - (U) \$ 135 Begin CAF and Joint certification testing for Battlefield Situation Display (BSD) (TADIL A, B, J). - (U) \$ 100 Existing automated test tool upgrades (JTD, Simulation Modeling Analysis Reporting Test System (SMARTS)). - (U) \$ 532 Message Text Standards configuration management (contractor support). - (U) \$ 177 NATO Message Text Standards configuration management (contractor support). - (U) \$ 347 Future information exchange development efforts. - (U) \$ 60 Direct technical support (contractor support). - (U) \$ 60 Continue expansion of MTF certification testing to fielded systems. - (U) \$ 835 TADIL configuration management (contractor support). - (U) \$ 454 Link 16 migration support (contractor support). - (U) \$ 275 TADIL configuration management (contractor support). - (U) \$ 94 Continue modification of message standards supporting TMD. - (U) \$ 94 Continue development of DMTD and VMF standards. - (U) \$ 100 Continue network design and aids development for JTIDS network design facility and architecture. - (U) \$ 120 Hardware/software integration technical support (contractor support). - (U) \$ 150 Continue hardware/software integration for F-15E, F-16 Block 50/52, RAOC/SAOC. - (U) \$ 50 Start hardware/software integration for F-16 Block 40/42. - (U) \$ 74 Continue development of TADIL documentation on CD ROM. 		
Project Project 1	Page 3 of 9 Pages	Exhibit R-2 (PE 0604779F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604779F Joint Interoperability Tactical Command/Control	PROJECT Project																																																							
<p>(U) \$ 4,972 Total</p> <p>(U) FY 1999</p> <ul style="list-style-type: none"> – (U) \$ 1,944 Certification Testing – (U) \$ 1,151 Message Text Formats – (U) \$ 2,728 TADILs Management <p>(U) \$ 5,823 Total</p> <p>(U) B. Program Change Summary (\$ in Thousands)</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998)</td> <td style="text-align: center;">5,606</td> <td style="text-align: center;">5,929</td> <td style="text-align: center;">5,940</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">5,976</td> <td style="text-align: center;">5,929</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. General Congressional Reduction</td> <td style="text-align: center;">-223</td> <td style="text-align: center;">-827</td> <td></td> <td></td> </tr> <tr> <td> b. Small Business Innovative Research</td> <td style="text-align: center;">-147</td> <td style="text-align: center;">-130</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus and other Above Threshold Reprogrammings</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogrammings</td> <td style="text-align: center;">-900</td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Recissions</td> <td style="text-align: center;">-9</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY98 PB</td> <td></td> <td></td> <td style="text-align: center;">-117</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/ FY 1999 President's Budget</td> <td style="text-align: center;">4,697</td> <td style="text-align: center;">4,972</td> <td style="text-align: center;">5,823</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p>Funding: Reprogramming in FY97 reduced FFRDC support for JSTARS testing and for Configuration Management. FY98 CGR and SBIR reductions (-\$957K) cut support by 75% from only USAF effort to operate NATO harmonization data/message link standardization, critical need to the USAF and mandatory for continued coalition operations. FY98 \$234K is pending reprogramming to other RDT&E requirements and service priorities.</p> <p>Schedule: Reductions have delayed operational interoperability certification one year for JSTARS, ABCCC, Iceland Air Defense and Counterdrug Surveillance and Control System and will force the service to limit interaction on data exchange issues with our allies.</p> <p>Technical: None</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY1998)	5,606	5,929	5,940	TBD	(U) Appropriated Value	5,976	5,929			(U) Adjustments to Appropriated Value					a. General Congressional Reduction	-223	-827			b. Small Business Innovative Research	-147	-130			c. Omnibus and other Above Threshold Reprogrammings					d. Below Threshold Reprogrammings	-900				e. Recissions	-9				(U) Adjustments to Budget Years Since FY98 PB			-117		(U) Current Budget Submit/ FY 1999 President's Budget	4,697	4,972	5,823	TBD
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
(U) Previous President's Budget (FY1998)	5,606	5,929	5,940	TBD																																																					
(U) Appropriated Value	5,976	5,929																																																							
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Project Project 1	Page 4 of 9 Pages	Exhibit R-2 (PE 0604779F)																																																							

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604779F Joint Interoperability Tactical Command/Control	PROJECT Project

(U) **C. Other Program Funding Summary (\$ in Thousands)** NOT APPLICABLE

(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) <u>CERTIFICATION TESTING</u> (Joint and CAF Interoperability)												
- MCE P3I												
CAF								X				
Joint	X									X		
- IADS												
CAF												
Joint	X											
- JSTARS												
CAF			X						X			
Joint						X					X	
- E-3 AWACS												
CAF						X			X			
Joint							X			X		
- F-15C												
CAF						X						
joint											X	
- CSCS												
CAF						X						
joint												
- ABCCC												
CAF								X				
joint												
- ADSI												
CAF								X				
joint										X		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604779F Joint Interoperability Tactical Command/Control	PROJECT Project
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	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) <u>OPFAC INSTALL/INTEGRATION</u>												
- F-15E												
Begin						X						
Complete											X	
- JSTARS												
Begin												
Complete							X					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604779F Joint Interoperability Tactical Command/Control	PROJECT Project
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Certification Testing	1,388	1,661	1,944
(U) Message Text Formats	706	706	1,151
(U) TADILs Management	2,603	2,605	2,728
(U) Total	4,697	4,972	5,823

Above categories have been changed beginning in FY97 to more accurately reflect program content.

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>

Product Development Organizations

NONE

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998	
BUDGET ACTIVITY			PE NUMBER AND TITLE				PROJECT	
5 - Engineering and Manufacturing Development			0604779F Joint Interoperability Tactical Command/Control				Project	
<u>Support and Management Organizations</u>								
MITRE	CPAF	OCT 72	30,900	2,050	2,230	2,288	Continuing	TBD
B3H	CPFF	MAY 97	0	1,162	1,040	1,489	Continuing	TBD
COMPTEK	CPAF	OCT 92	2,600	566	600	600	Continuing	TBD
HTI	CPAF	OCT 94	1,300	0	0	0	0	1,300
Prog Office	Various	Various		243	187	248	Continuing	TBD
AF Participating Test Unit (PTU)	PO/616	OCT 97		676	915	1,198	Continuing	TBD
<u>Test and Evaluation Organizations</u>								
NONE								

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998	
BUDGET ACTIVITY			PE NUMBER AND TITLE				PROJECT	
5 - Engineering and Manufacturing Development			0604779F Joint Interoperability Tactical Command/Control				Project	
Government Furnished Property: None								
Subtotal Product Development	0	0	0	0	0	0	Continuing	TBD
Subtotal Support and Management	0	0	34,800	4,697	4,972	5,823	Continuing	TBD
Subtotal Test and Evaluation	0	0	0	0	0	0	0	0
Total Project	0	0	34,800	4,697	4,972	5,823	Continuing	TBD
Project Project 1								

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604805F Commercial Operations and Support Savings Initiative (COSSI)	PROJECT 4771
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4771 Commercial Operations and Support Savings Initiative (COSSI)	0	0	27,937	31,040	31,013	30,777	30,740	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** This Engineering and Manufacturing Development (EMD) program aims at achieving operations and support (O&S) savings through insertion of commercial products and processes into fielded military systems. These savings are expected to result by reducing the costs of parts and maintenance, reducing the need for specialized equipment, increasing reliability, and increasing efficiency of subsystems. COSSI projects will be performed in two stages. In Stage I, each competitively selected, flexible cost share proposal will create the Non-Recurring Engineering (NRE) required to create a kit that can be used in a fielded military system and perform the testing needed to verify that inserted kits will produce O&S cost savings while at least maintaining the current system level of performance of the fielded system. Based on the results of a Stage I project, the Air Force will decide whether to proceed to Stage II. The goal in Stage II is to purchase a reasonable production quantity of kits without recompetition. This will be based on a fair and reasonable price (i.e., the value of the kits vice the cost of the kits to the Air Force under a Federal Acquisition Regulation (FAR) vehicle). Dual use technology was previously funded by the Defense Advanced Research Projects Agency (DARPA), first under the Technology Reinvestment Program (TRP) and then under DUAP. In FY 1997, the decision was made to begin transferring responsibility for DUAP from DARPA to the Services. The two existing DUAP efforts, DUAP S&T and the Commercial Operations and Support Savings Initiative (COSSI), were split and transferred into Service 6.2 and 6.4 PEs, respectively. This PE is the COSSI effort for the Air Force.

(U) **Acquisition Strategy:** Funding will be released to the SPDs for those projects that have been selected in that year for which they are the OPR. Other Transactions (OTs) for prototypes will be used during Stage I. OTs offer more flexibility and fewer regulatory requirements than a typical FAR contract. The authority to use OT was given by Section 804 of the Fiscal Year 1997 Defense Authorization Act.

(U) FY 1997: Not Applicable.

(U) FY 1998: Not Applicable.

(U) FY 1999 (\$ in Thousands):

- (U) \$27,937 Solicit projects that will reduce O&S costs of fielded military systems by insertion of commercial products and processes.

- (U) \$27,937 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604805F Commercial Operations and Support Savings Initiative (COSSI)		PROJECT 4771					
(U) B. <u>Program Change Summary (\$ in Thousands):</u>								
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>				
(U) Previous President's Budget (FY 1998 PB)	0	0	0	0				
(U) Appropriated Value	0	0	0	0				
(U) Adjustments to Appropriated Value								
a. Congressional/General Reductions								
b. SBIR								
c. Omnibus/Other Above Threshold Reprogrammings								
d. Below Threshold Reprogrammings								
(U) Adjustments to Budget Years Since FY 1998 PB			27,937					
(U) Current Budget Submit/FY 1999 PB			27,937	Continuing				
(U) Change Summary Explanation:								
Funding: Dual use technology was previously funded by the Defense Advanced Research Projects Agency (DARPA), first under the Technology Reinvestment Program (TRP) and then under DUAP. In FY 1997, the decision was made to begin transferring responsibility for DUAP from DARPA to the Services. The two existing DUAP efforts, DUAP S&T and Commercial Operations and Support Savings Initiative (COSSI), were split and transferred into Service 6.2 and 6.4 PEs, respectively. This PE is the COSSI effort for the Air Force.								
Schedule: Not Applicable.								
Technical: Not Applicable.								
(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> Not Applicable.								
(U) D. <u>Schedule Profile:</u>								
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>		
	1	2	3	4	1	2	3	4
(U) RFP Release					X			
(U) Contract Awards								X
Project 4771		Page 2 of 4 Pages			Exhibit R-2 (PE 0604805F)			

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604851F ICBM EMD
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	199,219	143,913	81,546	38,418	0	0	0	0	911,432
3085 Guidance Replacement Program (GRP)	113,027	77,455	20,578	7,808	0	0	0	0	561,209
4210 Propulsion Replacement Program (PRP)	83,434	66,458	60,968	30,610	0	0	0	0	347,465
13C4 Strategic C4 Program*	2,758	0	0	0	0	0	0	0	2,758
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* Project funding for FY98 and beyond is included in the Minimum Essential Emergency Communications Network (MEECN) Program Element (PE 0303131F)

(U) A. Mission Description and Budget Item Justification

(U) ICBM modernization efforts will extend the operational life of the Minuteman ICBM weapon system. The Guidance Replacement Program (GRP) will replace failing Minuteman guidance system electronics. The Propulsion Replacement Program (PRP) will remanufacture all three Minuteman solid fuel stages to correct age-related degradations and maintain existing weapon system reliability. The Strategic C4 (Command, Control, Communications, and Computers) Program will modernize the command, control, communications, and computer systems associated with assured force execution/termination of the ICBM forces. These efforts were defined and validated in DoD's Nuclear Posture Review.

(U) This program is in Budget Activity 5 - Engineering and Manufacturing Development because the projects are being developed for the Air Force but have not received production approval. Program control is exercised at the project level.

(U) Acquisition Strategy:

(U) The ICBM System Program Office (SPO) awarded a Prime Integration Contract (PIC) to TRW on 22 Dec 97. All future efforts will be conducted under the ICBM PIC unless other strategies are deemed more appropriate.

(U) Guidance Replacement Program. An EMD contract was awarded in Aug 93 to develop, test, and replace selected guidance electronics and software. This cost plus-award-fee (CPAF) contract was issued following full and open competition. The GRP contract will transfer to the PIC after Low Rate Initial Production (LRIP) contract award now planned for 2nd Qtr, FY1998.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604851F ICBM EMD
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(U) Propulsion Replacement Program. Planned acquisition will consist of all hardware and software modifications; integration and flight test support; delivery of remanufactured Stage 1, 2, and 3 motors; nuclear certification analysis tasks; and independent software certification. The PRP contract transfer to the PIC in Jan 98.

(U) Strategic C4. Work on this program in this Program Element was completed in FY97. Project funding for FY98 and beyond is budgeted in the Minimum Essential Emergency Communications Network (MEECN) Program Element (PE 0303131F).

(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget FY1998 PB	202,153	137,944	86,990	1,198,096
(U) Appropriated Value	212,295	152,944		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-4,675	-5,433		
b. SBIR	-5,467	-3,598		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-2,600			
e. Rescissions	-334			
(U) Adjustments to Budget Years Since FY 1998 PB			-5,444	
(U) Current Budget Submit/FY 1999 PB	199,219	143,913	81,546	911,432

(U) Change Summary Explanation: See individual projects for specifics changes.

(U) C. Other Program Funding Summary (\$ in Thousands):

PE 0101213F, Minuteman Squadrons, MMIII Modifications (APPN 14, BA-07, P-13)

(U) D. Schedule Profile: See individual programs.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604851F ICBM EMD	PROJECT 3085
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3085 Guidance Replacement Program (GRP)	113,027	77,455	20,578	7,808	0	0	0	0	561,209

(U) A. Mission Description and Budget Item Justification

(U) Ongoing upgrades are required to extend the service life of the Minuteman weapon system. The Joint Requirements Oversight Council validated the Mission Need Statement for a Future Guidance System for Intercontinental Ballistic Missiles (ICBM) on 5 November 1992. GRP replaces failing guidance system electronics, and preserves the option to configure the missiles with the Peacekeeper Mk 21 reentry vehicle and an advanced inertial measurement unit. The Engineering and Manufacturing Development (EMD) contract was awarded to Rockwell International in August 1993. GRP includes the EMD, production, and installation of replacement guidance components to extend the life of the operational Minuteman force. Funding reflected here is for EMD.

(U) FY 1997 (\$ in Thousands):

- (U) \$97,718 Hardware/software development.
- (U) \$4,991 Nuclear safety cross check analysis and independent validation and verification.
- (U) \$1,400 ICBM codes development.
- (U) \$4,960 Systems engineering and technical support.
- (U) \$3,185 Labs and support agencies.
- (U) \$773 Testing and other engineering support.
- (U) \$113,027 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$38,483 Continue hardware/software development.
- (U) \$4,997 Continue Nuclear Safety Cross Check Analysis and Independent Validation And Verification.
- (U) \$315 Complete ICBM codes development.
- (U) \$4,174 Continue systems engineering and technical support.
- (U) \$10,958 Continue labs and support agencies efforts.
- (U) \$17,957 Continue testing and other engineering support.
- (U) \$571 Pending reprogramming to fund higher priorities.

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BUDGET ACTIVITY
5 - Engineering and Manufacturing Development

PE NUMBER AND TITLE
0604851F ICBM EMD

- (U) \$77,455 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604851F ICBM EMD	PROJECT 3085																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$11,045 Continue hardware/software development. – (U) \$1,400 Continue Nuclear Safety Cross Check Analysis and Independent Validation And Verification. – (U) \$160 Continue labs and support agencies efforts. – (U) \$7,973 Continue testing and other engineering support. – (U) \$20,578 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: right; width: 10%;"><u>FY 1997</u></th> <th style="text-align: right; width: 10%;"><u>FY 1998</u></th> <th style="text-align: right; width: 10%;"><u>FY 1999</u></th> <th style="text-align: right; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">115,961</td> <td style="text-align: right;">66,943</td> <td style="text-align: right;">20,993</td> <td style="text-align: right;">547,731</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">121,911</td> <td style="text-align: right;">81,943</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td style="text-align: right;">-2,783</td> <td style="text-align: right;">-2,888</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-3,167</td> <td style="text-align: right;">-1,600</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: right;">-2,600</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: right;">-334</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-415</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">113,027</td> <td style="text-align: right;">77,455</td> <td style="text-align: right;">20,578</td> <td style="text-align: right;">561,209</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation (\$ in Thousands):</p> <p style="padding-left: 20px;">Funding: Congress added \$15,000 to FY98 PB request to preserve the option of incorporating the Mk-21 reentry vehicle on Minuteman III.</p> <p style="padding-left: 20px;">Schedule: EMD phase extended to accomplish closeout actions.</p> <p style="padding-left: 20px;">Technical: No significant impact.</p> <p>(U) <u>C. Other Program Funding Summary (\$ in Thousands):</u></p> <p style="padding-left: 20px;">PE 0101213F, Minuteman Squadrons, MMIII Modifications (APPN 14, BA-07, P-13)</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	115,961	66,943	20,993	547,731	(U) Appropriated Value	121,911	81,943			(U) Adjustments to Appropriated Value					a. Cong Reductions	-2,783	-2,888			b. SBIR	-3,167	-1,600			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	-2,600				e. Rescissions	-334				(U) Adjustments to Budget Years Since FY 1998 PB			-415		(U) Current Budget Submit/FY 1999 President's Budget	113,027	77,455	20,578	561,209
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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(U) Adjustments to Budget Years Since FY 1998 PB			-415																																																						
(U) Current Budget Submit/FY 1999 President's Budget	113,027	77,455	20,578	561,209																																																					
Project 3085	<i>Page 4 of 15 Pages</i>	Exhibit R-2 (PE 0604851F)																																																							

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604851F ICBM EMD	PROJECT 3085
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Program Milestones												
Milestone III AFSARC										X		
(U) Engineering Milestones												
CDR				X*								
(U) T&E Milestones												
Combined DT&E/IOT&E Start										X		
First Flight Test										X		
(U) Contract Milestones												
(U) Low Rate Initial Production								X				
* Started/Completed												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604851F ICBM EMD	PROJECT 3085
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Hardware/Software Development	97,718	38,483	11,045
(U) ICBM Codes Contract	1,400	315	0
(U) Nuclear Safety Cross Check Analysis Contract	4,991	4,997	1,400
(U) Labs/Agencies	3,185	10,958	160
(U) SETA	4,960	4,174	0
(U) Other Engineering Support & Testing	773	17,957	7,973
(U) Other - Pending Reprogramming		571	
(U) Total	113,027	77,455	20,578

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Boeing-North American	C/CPAF	31 Aug 93	425,128	425,128	282,200	97,718	38,483	0	0	418,401
Codes Contract			4,662	4,662	2,947	1,400	315	0	0	4,662
TRW (Prime)	C/CPAF	Dec 97	11,045	11,045	0	0	0	11,045	0	11,045

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604851F ICBM EMD					PROJECT 3085
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
NSCCA/IV&V	SS/CPAF	31 Mar 94	20,306	20,306	8,918	4,991	4,997	1,400	0	20,306
TRW	SS/CPAF	4 Jan 94	43,275	43,275	34,111	4,960	4,174	0	0	43,245
CSDL	SS/FFP	30 Jun 94	5,264	5,264	5,264	0	0	0	0	5,264
Other Engineering Support	Various	31 Aug 93	43,195	43,195	7,763	885	18,225	7,973	7,808	42,654
Other - Pending Reprogramming							571			571
<u>Test and Evaluation Organizations</u>										
AGMC	PO		160	160	160	0	0	0	0	160
White Sands	PO	Annual	649	649	317	207	125	0	0	649
VAFB	PO/MIPR	Annual	11,180	11,180	587	1,101	9,492	0	0	11,180
Maxwell	MIPR		27	27	27	0	0	0	0	27
Sandia	MIPR		2,985	2,985	0	1,765	1,060	160	0	2,985
Physics Int	MIPR		22	22	22	0	0	0	0	22
Little Mountain	PO		33	33	25	0	13	0	0	38
Government Furnished Property: None.										
					Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Subtotal Product Development					285,147	99,118	38,798	11,045		434,108
Subtotal Support and Management					56,056	10,836	27,967	9,373	7,808	112,040
Subtotal Test and Evaluation					1,138	3,073	10,690	160		15,061
Total Project					342,341	113,027	77,455	20,578	7,808	561,209

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604851F ICBM EMD			PROJECT 4210		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4210 Propulsion Replacement Program (PRP)	83,434	66,458	60,968	30,610	0	0	0	0	347,465
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) The Propulsion Replacement Program will remanufacture all three solid fuel stages to correct age-related degradations, maintain existing weapon system reliability, and support Minuteman life extension. Any of the degradations (propellant cracking, case corrosion, liner deterioration, inhibitor deterioration, and liner debond) can cause catastrophic motor failure and, in turn, mission failure. RDT&E efforts will identify replacement materials that are no longer available or which have become environmentally unacceptable, reduce life cycle costs, and identify corrections to age-related degradations. This project incorporates only changes that can be demonstrated in an appropriate time frame to ensure the Minuteman propulsion system continues to meet existing performance capabilities and remains viable and supportable. The project entered Phase 2 (Engineering Manufacturing and Development) in FY94.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$20,568 Continued component reuse and materials replacement studies; continued stage design and development to include refurbishment. - (U) \$20,610 Integrated program activities such as system engineering, program management, range support, Arnold Engineering Development Center (AEDC) testing, booster disassembly/assembly, booster transportation. - (U) \$22,257 Continued fabrication, tooling and waste disposal for change verification motors. - (U) \$3,402 Began software modification. - (U) \$1,304 Began ordnance development effort. - (U) \$15,293 Other - (U) \$83,434 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$51,776 Continue component reuse and materials replacement studies, continue stage design and development to include refurbishment. Continue fabrication, tooling, and waste disposal for change verification motor testing. - (U) \$8,292 Continue integration of program activities such as system engineering, program management, range support, AEDC testing, booster disassembly/assembly, booster transportation. - (U) \$4,038 Continue software modification. - (U) \$1,924 Continue ordnance development effort. - (U) \$428 Pending reprogramming to fund higher priorities. - (U) \$66,458 Total 									
Project 4210			Page 8 of 15 Pages			Exhibit R-2 (PE 0604851F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604851F ICBM EMD	PROJECT 4210																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$39,316 Continue component reuse and materials replacement studies, continue stage design and development to include refurbishment. Continue fabrication, tooling, and waste disposal for change verification motor testing. – (U) \$17,260 Continue integration of program activities such as system engineering, program management, range support, AEDC testing, booster disassembly/assembly, booster transportation. – (U) \$3,887 Continue software modification. – (U) \$505 Continue ordnance development effort. – (U) \$60,968 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">83,434</td> <td style="text-align: right;">71,001</td> <td style="text-align: right;">65,997</td> <td style="text-align: right;">353,627</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">87,567</td> <td style="text-align: right;">71,001</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td style="text-align: right;">-1,833</td> <td style="text-align: right;">-2,545</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-2,300</td> <td style="text-align: right;">-1,998</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-5,029</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">83,434</td> <td style="text-align: right;">66,458</td> <td style="text-align: right;">60,968</td> <td style="text-align: right;">347,465</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: FY99 funding reduced due to savings from the ICBM Prime Integrating Contract and transfers to fund higher priority needs.</p> <p style="padding-left: 20px;">Schedule: No significant impact.</p> <p style="padding-left: 20px;">Technical: No significant impact.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	83,434	71,001	65,997	353,627	(U) Appropriated Value	87,567	71,001			(U) Adjustments to Appropriated Value					a. Cong Reductions	-1,833	-2,545			b. SBIR	-2,300	-1,998			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB			-5,029		(U) Current Budget Submit/FY 1999 President's Budget	83,434	66,458	60,968	347,465
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Project 4210	Page 9 of 15 Pages	Exhibit R-2 (PE 0604851F)																																																							

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604851F ICBM EMD	PROJECT 4210
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(U) **C. Other Program Funding Summary (\$ in Thousands):**

PE 0101213F, Minuteman Squadrons, MMIII Modifications (APPN 14, BA-07, P-13)

(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Engineering Milestones												
(U) Stage PDR	X*											
(U) Stage CDR							X					
(U) T&E Milestones												
(U) Motor Testing	X*	X*	X*	X*	X*	X	X	X	X	X	X	X
(U) Contract Milestones												
(U) Software Contract Award	X*											
(U) Begin DT&E/IOT&E							X					

* Started/Completed

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998					
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604851F ICBM EMD			PROJECT 4210				
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>											
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>					
(U)	Technology Insertion			54,115	56,165	50,098					
(U)	Software			3,402	4,038	3,887					
(U)	Other Program Costs			3,312	3,812	6,983					
(U)	SETA			7,312	2,015	0					
(U)	Other			15,293	0	0					
(U)	Other - Pending Reprogramming				428	0					
(U)	Total			83,434	66,458	60,968					
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
<u>Contractor or</u>	<u>Contract</u>										
<u>Government</u>	<u>Method/Type</u>	<u>Award or</u>	<u>Performing</u>	<u>Project</u>	<u>Total</u>						
<u>Performing</u>	<u>or Funding</u>	<u>Obligation</u>	<u>Activity</u>	<u>Office</u>	<u>Prior to</u>	<u>Budget</u>	<u>Budget</u>	<u>Budget</u>	<u>Budget to</u>	<u>Total</u>	
<u>Activity</u>	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>	
<u>Product Development Organizations</u>											
Thiokol	SS/CPAF	Aug 94	64,160	64,160	26,475	21,206	16,479	0	0	64,160	
Aerojet	SS/CPAF	Jul 94	58,425	58,425	29,893	13,709	14,833	0	0	58,435	
CSD	SS/CPAF	Jul 94	75,537	75,537	35,873	19,200	20,464	0	0	75,537	
Thiokol	C/CPAF	Feb 97	3,228	3,228	0	1,304	1,924	0	0	3,228	
Boeing NA	C/CPAF	Oct 96	3,406	3,406	0	1,399	2,007	0	0	3,406	
Logicon	C/CPAF	Oct 96	5,437	5,437	0	1,482	1,526	1,604	825	5,437	
GTE	C/CPAF	Oct 96	1,027	1,027	0	522	505	0	0	1,027	
TRW (Prime)	C/CPAF	Dec 97	71,135	71,135	0	0	2,369	52,380	16,386	71,135	
Project 4210											
Page 11 of 15 Pages											
Exhibit R-3 (PE 0604851F)											

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604851F ICBM EMD					PROJECT 4210
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
TRW	SS/CPAF	Oct 94	n/a	21,020	11,828	7,177	2,015	0	0	21,020
Program Integration			n/a	8,161	412	472	1,719	4,585	973	8,161
Other				15,967	222	15,293	150	152	150	15,967
Other - Pending Reductions							428			428
<u>Test and Evaluation Organizations</u>										
AEDC	PO	Periodic	n/a	9,533	1,276	1,670	1,960	2,247	2,380	9,533
Range (VAFB)	PO	Nov 99	n/a	9,975	0	0	79	0	9,896	9,975
Phillips Lab	PO			15	15	0	0	0	0	15
Government Furnished Property: None.										
					Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Subtotal Product Development					92,241	58,822	60,107	53,984	17,211	282,365
Subtotal Support and Management					12,462	22,942	4,312	4,737	1,123	45,576
Subtotal Test and Evaluation					1,291	1,670	2,039	2,247	12,276	19,523
Total Project					105,994	83,434	66,458	60,968	30,610	347,464

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998																																																				
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604851F ICBM EMD			PROJECT 13C4																																																				
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost																																																		
13C4 Strategic C4 Program*	2,758	0	0	0	0	0	0	0	2,758																																																		
<p>* Project funding for FY98 and Beyond is included in the Minimum Essential Emergency Communications Network (MEECN) Program Element (PE 0303131F)</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) Effective in FY98, MMRT development was transferred to PE 0303131F, Minimum Essential Emergency Communications Network (MEECN), BPAC 2832, VLF/LF System Improvements.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,758 Initiated MMRT modification and integration into ICBM LCCs. (Only task.) - (U) \$2,758 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u> Transferred to MEECN (PE 0303131F)</p> <ul style="list-style-type: none"> - (U) \$0 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u> Transferred to MEECN (PE 0303131F)</p> <ul style="list-style-type: none"> - (U) \$0 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table border="0"> <thead> <tr> <th></th> <th align="right"><u>FY 1997</u></th> <th align="right"><u>FY 1998</u></th> <th align="right"><u>FY 1999</u></th> <th align="right"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td align="right">2,758</td> <td align="right">0</td> <td align="right">0</td> <td align="right">2,758</td> </tr> <tr> <td>(U) Appropriated Value</td> <td align="right">2,817</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Reductions</td> <td align="right">-59</td> <td></td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>											<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	2,758	0	0	2,758	(U) Appropriated Value	2,817				(U) Adjustments to Appropriated Value					a. Cong Reductions	-59				b. SBIR					c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB				
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<p>Project 13C4</p> <p align="center">Page 13 of 15 Pages</p> <p align="right">Exhibit R-2 (PE 0604851F)</p>																																																											

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998					
BUDGET ACTIVITY	PE NUMBER AND TITLE			PROJECT			
5 - Engineering and Manufacturing Development	0604851F ICBM EMD			13C4			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>			
(U) Current Budget Submit/FY 1999 President's Budget	2,758	0	0	2,758			
(U) Change Summary Explanation:							
Funding: No changes.							
Schedule: No changes.							
Technical: No changes.							
(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> See Minimum Essential Emergency Communications Network (MEECN) Program Element, PE 0303131F.							
(U) D. <u>Schedule Profile</u>							
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>	
		1 2 3 4	1	2 3 4	1	2 3 4	
(U) MMRT development for ICBM LCCs		X*					
* Started/Completed - (Transferred to MEECN (PE 0303131F) in FY98)							

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0604851F ICBM EMD			PROJECT 13C4		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Development of MMRTs for ICBM LCCs				2,758	0	0			
(U)	Total				2,758	0	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Rockwell International	C/CPAF	Feb 97			2,758	0	2,758	0	0	2,758
<u>Support and Management Organizations:</u> None										
<u>Test and Evaluation Organizations:</u> None										
Government Furnished Property: None.										
					<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development						2,758				2,758
Subtotal Support and Management										
Subtotal Test and Evaluation										
Total Project						2,758				2,758
Project 13C4										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604853F Evolved Exp Launch Veh - EMD (Space)	PROJECT 0004
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0004 Evolved Expendable Launch Vehicle	0	26,572	280,297	338,319	305,557	244,450	14,822	0	1,210,017
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification:

The Evolved Expendable Launch Vehicle (EELV) program is a space launch system development program. The mission of the EELV program is to partner with industry to develop a national launch capability that satisfies the Government's National Mission Model (NMM) requirements and reduces the cost of space launch by at least 25%. The EELV system includes the launch vehicles, infrastructure, support systems, and interfaces. EELV will provide up to two families of launch vehicles that will launch the Government portion of the NMM currently serviced by Titan II, Delta II, Atlas II, and Titan IV. Evolved from current expendable launch systems or components thereof, EELV will support military, intelligence, and civil mission requirements. This program element is in Budget Activity 5, Engineering and Manufacturing Development, because it supports engineering and manufacturing development of the EELV concept leading to deployment of a lower cost expendable launch vehicle system.

(U) Acquisition Strategy:

The EELV concept of a family of launch vehicles emphasizes commonality of hardware and infrastructure and economies of scale to enhance production, operations, and support efficiencies. Cost improvements will be achieved through commonality; leveraging the commercial market place; reduction of supporting infrastructure (launch pads, manufacturing facilities, workforce); and optimization of production and launch operations, processes, and rates. EELV is an ongoing competitive program that initially used a rolling downselect acquisition strategy. In August 1995 four initial contracts were awarded for the Low Cost Concept Validation (LCCV) phase. In December 1996 the Air Force downselected to two contractors – Lockheed Martin and Boeing (originally McDonnell Douglas) – for the Pre-Engineering and Manufacturing Development (Pre-EMD) phase. In the summer of 1998, contracts will be awarded for the Engineering and Manufacturing Development (EMD) and Initial Launch Services (ILS) phase. The EMD/ILS approach maintains competition throughout the life of the program, leverages the growing commercial launch market, caps the Government's EMD costs, and allows partnership with industry, while still reducing the program's overall cost to launch the NMM by at least 25% over existing systems. The EELV system will launch the government portion of the NMM through 2020.

(U) FY 1997 (\$ in Thousands)

– (U) \$0 EELV funded in PE 0603853F in FY 1996, FY 1997, and FY 1998.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
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<p>(U) <u>FY 1998 (\$ in Thousands)</u></p> <ul style="list-style-type: none"> - (U) \$22,800 System development - (U) \$ 3,000 Systems Engineering - (U) \$ 772 Program management and other support costs - (U) \$26,572 Total <p>(U) <u>FY 1999 (\$ in Thousands)</u></p> <ul style="list-style-type: none"> - (U) \$264,000 Continue system development - (U) \$ 12,200 Systems Engineering - (U) \$ 4,097 Program management and other support costs - (U) \$280,297 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">28,376</td> <td style="text-align: center;">293,950</td> <td style="text-align: center;">1,718,485</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">0</td> <td style="text-align: center;">28,376</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional General Reductions</td> <td></td> <td style="text-align: center;">- 1,132</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. Small Business Innovative Research</td> <td></td> <td style="text-align: center;">- 672</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or other above threshold reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY98 PB</td> <td></td> <td></td> <td style="text-align: center;">- 13,653</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">0</td> <td style="text-align: center;">26,572</td> <td style="text-align: center;">280,297</td> <td style="text-align: center;">1,210,017</td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	0	28,376	293,950	1,718,485	(U) Appropriated Value	0	28,376			(U) Adjustments to Appropriated Value					a. Congressional General Reductions		- 1,132			b. Small Business Innovative Research		- 672			c. Omnibus or other above threshold reprogramming					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY98 PB			- 13,653		(U) Current Budget Submit/FY 1999 President's Budget	0	26,572	280,297	1,210,017
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Project 0004	Page 2 of 5 Pages	Exhibit R-2 (PE 0604853F)																																																							

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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604853F Evolved Exp Launch Veh - EMD (Space)				PROJECT 0004		
(U) Change Summary Explanation:										
<ul style="list-style-type: none"> - Funding: The FY98 changes involved Congressional and SBIR reductions. FY99 funding reduced to fund higher priority AF projects. This funding implements the new EELV acquisition strategy which caps the two EMD contracts and moves the two test launches from EMD into ILS. - Schedule: Not Applicable. - Technical: Not Applicable. 										
(U) C. Other Program Funding Summary (\$ in Thousands)										
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Comp</u>	<u>Total</u>	
(U) NRO (non-AF budget)	18,600	4,200							95,100*	
(U) Missile Procurement, AF (PE 0305953F)				204,576	360,818	359,442	559,717	Cont.	Cont.	
(U) DARPA (Non-AF budget) (PE 0603226E)									9,845**	
Related RDT&E:										
(U) EELV Demonstration and Validation (PE 0603853F)	44,263	60,437	0	0	0	0	0	0	173,153***	
(U) EELV Operational System Development (PE 0305953F)			3,316	3,397	3,477	2,320	766	Cont.	Cont.	
* Total includes funding in FY96.										
** Total includes funding in FY94.										
*** Total includes funding in FY95 and FY96.										
(U) D. Schedule Profile										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	
EMD Module										
(U) Defense Acquisition Board - Milestone II									X	
(U) Development/Initial Launch Services contract awards									X	
(U) Tailored Critical Design Review completed No Later Than Dec 98								X		
(U) Launch vehicle production start planned for 1st quarter FY00										
Project 0004										
Page 3 of 5 Pages										
Exhibit R-2 (PE 0604853F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0604853F Evolved Exp Launch Veh - EMD (Space)				PROJECT 0004		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U)	EMD Contracts			0	22,800	264,000				
(U)	Systems Engineering			0	3,000	12,200				
(U)	Program management and other support costs			0	772	4,097				
(U)	Total			0	26,572	280,297				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Lockheed Martin	C/FFP	Jun 98	500,000		0	0	11,400	132,000	416,600	560,000
Boeing	C/FFP	Jun 98	500,000		0	0	11,400	132,000	416,600	560,000
<u>Support and Management Organizations</u>										
SPO Mission Spt	Various	Various	N/A	N/A	0	0	472	2,697	11,048	14,217
FFRDC	SS/CPAF	Annual	N/A	N/A	0	0	3,000	12,200	51,400	66,600
Ranges	Various	Various	N/A	N/A	0	0	100	400	3,100	3,600
Other Cntr Spt	Various	Various	N/A	N/A	0	0	200	1,000	4,400	5,600
<u>Test and Evaluation Organizations</u>										
Not Applicable					0	0	0	0	0	0
Project 0004				Page 4 of 5 Pages			Exhibit R-3 (PE 0604853F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0604853F Evolved Exp Launch Veh - EMD (Space)	PROJECT 0004
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Government Furnished Property: Not Applicable

Subtotal Product Development	0	0	22,800	264,000	833,200	1,120,000
Subtotal Support and Management	0	0	3,772	16,297	69,948	90,017
Subtotal Test and Evaluation	0	0	0	0	0	0
Total Project	0	0	26,572	280,297	903,148	1,210,017

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development				PE NUMBER AND TITLE 0605011F RDT&E FOR AGING AIRCRAFT				PROJECT 4685	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4685 Aging Aircraft	0	0	4,901	4,978	14,583	29,035	43,364	0	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This program is comprised of multiple efforts which will transition needed technologies from laboratory research and commercial technology development into fieldable tools or capabilities. Projects will target critical needs of the aging fleet such as corrosion, structural integrity, and improved non-destructive inspection (NDI) methods. Corrosion-related projects include hidden corrosion detection (NDI methods such as eddy current and thermography) and developing a corrosion prediction capability. Structural integrity projects will include the development of alternate repair capabilities and capability to predict widespread fatigue damage. In addition to the NDI projects addressing corrosion detection, other NDI projects will address multi-layer crack detection and detection of cracks under composite patches. These projects are focused on developing tools (NDI equipment, computer models) and capabilities (alternate repair processes) for Air Logistics Centers (ALCs) use in extending useful aircraft service life, resolving flight safety problems, or replacing components no longer procurable. Projects will typically yield a single, validated prototype system or capability that is production ready; final depot or field implementation (equipment purchases, tech order updates, training, etc.) will be the responsibility of the Major Commands (MAJCOMs) and ALCs. There is strong emphasis on developing solutions that will benefit multiple weapon systems, thereby reducing or eliminating stovepipe development of platform-specific solutions. This program is in Budget Activity 5, Engineering and Manufacturing Development, because projects/capabilities will be developed in this program then made available for procurement by already operational systems.</p> <p>(U) <u>Acquisition Strategy:</u> Funding will be released to the ALCs for the projects they are OPR for in that year. OPR will determine the most appropriate contract vehicle, DEP contract or full and open competition, to accomplish the project. However, since this is an FY 1999 new start, the Air Force is still refining the acquisition strategy.</p> <p>(U) <u>FY 1997:</u> Not Applicable.</p> <p>(U) <u>FY 1998:</u> Not Applicable.</p>									
Project 4685			Page 1 of 5 Pages			Exhibit R-2 (PE 0605011F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0605011F RDT&E FOR AGING AIRCRAFT	PROJECT 4685
(U) <u>FY 1999 (\$ in Thousands):</u>		
<ul style="list-style-type: none"> - (U) \$3,159 - (U) \$855 - (U) \$887 - (U) \$4,901 	<ul style="list-style-type: none"> Develop improved capabilities for corrosion prevention and control which will ultimately reduce the associated maintenance burden. Improve corrosion detection capabilities to decrease inspection times and/or detect corrosion earlier. Develop a corrosion prediction model which will allow the maintainer to better make repair decisions and improve future scheduling of corrosion maintenance actions. <ul style="list-style-type: none"> - (U) Improve reliability of eddy current inspections for the detection of corrosion in large aircraft lap joints. - (U) Improve usability of the D-Sight optical scanning system to provide a quick initial assessment of corrosion damage when an aircraft first enters the depot which will identify areas requiring a more detailed inspection. - (U) Evaluate thermography and dripless bubbler to determine effectiveness in detecting corrosion around wing skin fasteners, thus eliminating the need to remove fasteners to do inspection and to implement improvements to the initial prototype to improve usability in a depot. - (U) Optimize a lamb-wave ultrasound system to detect hidden corrosion within the shadow of installed wing skin fasteners. - (U) Develop a corrosion prediction model which will allow tailoring of depot work requirements. Develop improved non-destructive inspection techniques that will reduce the time required to detect flaws and damage, such as fatigue cracking, corrosion, disbonds, and trapped moisture and/or allow the damage to be found earlier, thus allowing for less extensive or costly repairs. <ul style="list-style-type: none"> - (U) Optimize a low-frequency eddy current system to be able to detect smaller flaws beneath relatively thick structure, particularly around fasteners. - (U) Evaluate non-destructive techniques to determine most effective methods to inspect repair patch bond integrity and to monitor crack growth underneath the patch. - (U) Characterize key eddy current parameters, such as center frequency and lift-off curves, to optimize non-destructive inspection methodologies and improve the reliability of the inspections. Develop technologies to ensure the continued structural integrity of aging weapon systems. <ul style="list-style-type: none"> - (U) Evaluate the applicability of an acoustic emission monitoring system to detect fatigue crack initiation and monitor crack growth. Total 	
Project 4685	Page 2 of 5 Pages	Exhibit R-2 (PE 0605011F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)			DATE February 1998	
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0605011F RDT&E FOR AGING AIRCRAFT	PROJECT 4685		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	0	0	0	Continuing
(U) Appropriated Value	0	0	0	
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions				
b. SBIR				
c. Omnibus/Other Above Threshold Reprogrammings				
d. Below Threshold Reprogrammings				
(U) Adjustments to Budget Years Since FY 1998 PB			4,901	
(U) Current Budget Submit/FY 1999 PB	0	0	4,901	Continuing
 (U) Change Summary Explanation:				
Funding: New start program.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
 (U) C. <u>Other Program Funding Summary:</u> Not Applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1998
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BUDGET ACTIVITY 5 - Engineering and Manufacturing Development	PE NUMBER AND TITLE 0605011F RDT&E FOR AGING AIRCRAFT	PROJECT 4685
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(U) **D. Schedule Profile:**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) RFP Release									X			
(U) Contract Award										X		
(U) Large Area Optical Corrosion Detection Project Complete												X
(U) Crack Propagation Monitoring Under Composite Patches Project Complete												X
(U) Aircraft Crack Monitoring System Project Complete												X
(U) Lamb Wave Ultrasonic Project Complete												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 5 - Engineering and Manufacturing Development					PE NUMBER AND TITLE 0605011F RDT&E FOR AGING AIRCRAFT				PROJECT 4685	
(U) A. <u>Project Cost Breakdown (\$ in Thousands):</u>										
					<u>FY 1997</u>	<u>FY 1998</u>		<u>FY 1999</u>		
(U) Corrosion prevention and control techniques								3,159		
(U) Improved non-destructive inspection capabilities								855		
(U) Technologies to enhance structural integrity								887		
(U) Total					0	0		4,901		
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands):</u>										
<u>Performing Organizations:</u>										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	FY 1999	To Complete	Total Program
Product Development Organizations										
Numerous	Various	Various	None	None	0	0	0	4,901	Cont	Cont
Support and Management Organizations - In-House Support.										
Test and Evaluation Organizations - Not Applicable.										
<u>Government Furnished Property - Not Applicable.</u>										
Subtotal Product Development					0	0	0	4,901	Cont	Cont
Subtotal Support and Management					0	0	0	0	0	0
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					0	0	0	4,901	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0603402F Space Test Program (Space)	PROJECT 2617
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2617 Free-Flyer Spacecraft Missions	46,367	38,696	0	0	0	0	0	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Program was not terminated. Space Test Program (Space) PE 0603402F changes to PE 0605864F in FY99. Future year funding is in the new PE 0605864F.

(U) A. Mission Description and Budget Item Justification

(U) The Space Test Program (STP) provides support to the DoD space research community by centrally financing acquisition of a host satellite or launch vehicle, the launch, and initial operations costs for experiments with military relevance whose scope ranges from basic research to advanced development. STP missions are the most cost effective way to flight test new space systems technologies, concepts and designs, providing an inexpensive way to:

- Demonstrate the feasibility of new space systems and technologies
- Improve operational design by characterizing the space environment, event, or sensor physics proposed for an operational system/system upgrade
- Provide early operational capabilities to evaluate usefulness or quickly react to new developments
- Perform operational risk reduction through direct flight test of prototype components
- Develop the knowledge base from which to plan new and improved operational systems and system upgrades
- Develop and test advanced small launch vehicle technology and capabilities

This DoD program provides the primary spaceflight capability to perform fly-before-buy, risk-reducing demonstrations of advanced technologies in operational space environments. The Secretary of Defense issued a policy statement in November 1995 reaffirming STP's role as the primary provider of spaceflight for the entire DoD space research community. Space Test Program is a Budget Activity 6 RDT&E Management and Support program.

(U) Acquisition Strategy

(U) The space research experiments that STP supports are justified, developed, financed, and delivered by various Service laboratories and DoD agencies, with the goal of improving DoD's current and future operational space systems' performance. Experiments are considered for spaceflight based on the priority that they are assigned by the annual DoD Space Experiments Review Board, a group that is independent of the STP Program Office, and is comprised of Air Force, Army, Navy, BMDO and other representatives with expertise in DoD operational space requirements. The Board gives the prioritized list of experiments to STP, who then seeks out the most cost effective means of spaceflight to maximize the number of experiments flown within the constraints of priority, opportunity and available funding. The most common spaceflight opportunities include piggybacking on military or commercial satellites, both foreign and domestic, and the various payload modes of the Space Shuttle. For those experiments whose requirements cannot be satisfied with these "secondary" opportunities, dedicated STP spacecraft and launch vehicle hardware are procured within the constraints of available funding and according to experiment requirements. These include Small and Medium Launch Vehicle class satellites, as well as Small Launch Vehicle class boosters (such as Pegasus, Taurus, and Lockheed Martin Athena). Medium Launch Vehicle class boosters are provided as required by PE 35119F and PE 35953F. If a particular manifested experiment fails to materialize or is deemed impractical to fly given current

BUDGET ACTIVITY
6 - Management and Support

PE NUMBER AND TITLE
0603402F Space Test Program (Space)

funding, or if the appropriate spaceflight opportunity becomes unavailable, STP shifts what resources remain to provide spaceflight support for the next highest priority experiments.

(U) The Air Force requires a stable funding level and the flexibility necessary to take advantage of whatever means of spaceflight is deemed to be most cost effective for a given experiment or complement of experiments. This flexibility is essential to take advantage of inexpensive "target of opportunity" space hardware, including operational spacecraft, where margin is usually firmly identified during the later stages of spacecraft development. This assures that the greatest amount of DoD space research is accomplished with the limited funds available. Without the requested funding, DoD would lose its most successful and most cost-effective capability to launch and test new technologies prior to their incorporation into our nation's very expensive and demanding operational space systems. Insufficient funding would also force each of the Services and DoD agencies to create individual launch capabilities in an attempt to duplicate STP's current low-cost, risk mitigating capability. Such a redundancy would result in the loss of the contractual economy of scale that a single space test organization provides, as well as the filtering function of the DoD Space Experiments Review Board in assuring quality experiments and minimum duplication.

(U) FY 1997 (\$ in Thousands)

- (U) \$11,171 Piggyback/secondary payload missions, mission planning, Aerospace Corp support, mission support.
- (U) \$26,381 Complete STEP-4 satellite and Pegasus Launch Vehicle; continue ARGOS and TSX-5 satellites, TSX-5 launch service; FORTE and STEP- 4 launch processing.
- (U) \$ 2,582 Space Shuttle payload engineering, analysis, pre- and post-launch processing, and launch support.
- (U) \$ 3,233 Start Taurus Launch Vehicle for Multispectral Thermal Imager (MTI) mission.
- (U) \$ 3,000 Pending reprogramming to fund higher priorities.
- (U) \$46,367 Total

(U) FY 1998 (\$ in Thousands)

- (U) \$ 8,441 Piggyback/secondary payload missions, mission planning, Aerospace Corp support, mission and program support.
- (U) \$23,855 Complete ARGOS satellite; STEP-4 and ARGOS launch/operations support; start JAWSAT; continue MTI Taurus Launch Vehicle.
- (U) \$ 2,900 Space Shuttle payload engineering, analysis, pre- and post-launch processing, and launch support.
- (U) \$ 3,500 Initiate reusable upper stage/bus development activities for spaceflight of SERB approved experiments.
- (U) \$38,696 Total

(U) FY 1999 (\$ in Thousands)

- (U) \$0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0603402F Space Test Program (Space)	PROJECT 2617		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	43,439	42,241	56,157	Continuing
(U) Appropriated Value	44,752	42,241		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-1,174	-2,556		
b. SBIR	-139	-989		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	3,000			
e. Rescission	-72			
(U) Adjustments to Budget Years Since FY1998 PB			-56,157	
(U) Current Budget Submit/FY1999 President's Budget	46,367	38,696	0	Continuing
(U) Change Summary Explanation:				
<p>Funding: \$3,000K added to program in FY97. This funding was subsequently reprogrammed to fund higher priorities. FY98 \$268K is pending reprogramming to fund higher priorities and for additional SBIR reduction. Space Test Program (Space) PE 0603402F changes to PE 0605864F in FY99. Future year funding is in the new STP PE 0605864F. \$9,300K FY99 funding rephased into FY00/01 due to FY97 execution. Remaining \$45,933K transferred to PE 0605864F.</p> <p>Schedule: STP EELV mission moved from FY01 to FY02.</p> <p>Technical: Not Applicable.</p>				
(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u>				
Not Applicable.				
<u>Related RDT&E:</u>				
(U) PE 0305119F, Medium Launch Vehicles				
(U) PE 0305953F, Evolved Expendable Launch Vehicle				
(U) PE 0605864F, STP funding for FY99 and beyond				
Experiments are funded by many Science and Technology (S&T) PEs in Air Force, Army, Navy, DARPA, BMDO, DoE, NASA, and other programs.				
Project 2617	Page 3 of 4 Pages	Exhibit R-2 (PE 0603402F)		

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BUDGET ACTIVITY
6 - Management and Support

PE NUMBER AND TITLE
0603402F Space Test Program (Space)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0603402F Space Test Program (Space)	PROJECT 2617
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(U) **D. Schedule Profile** These are anticipated launch dates. (Current projection. Experiments are added as new spaceflight opportunities and budget permits).

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) STS-80 CCM-A, MSX	X											
(U) STS-81 CREAM, MSX		X										
(U) STS-82 MSX		X										
(U) STS-83 CRYOFD, MSX		X										
(U) STS-84 RME-III, CREAM, MSX, SIMPLEX				X								
(U) STS-94* CRYOFD, PLUMES				X								
(U) MPTB (Classified Host) (S96-1)					X							
(U) FORTE (P94-1)					X							
(U) STS-85 CFE, MSX, MAHRSI (S96-5)					X							
(U) STS-86 SIMPLEX, CREAM, CCM-A					X							
(U) STEP4-EMPE, OOAM, DIDM (P95-1)									X			
(U) STS-87 MSX, SIMPLEX					X							
(U) POAM III (SPOT IV) (S96-2)										X		
(U) STS-89 CREAM, MSX, SIMPLEX										X		
(U) STS-91* CREAM, MSX, SIMPLEX										X		
(U) ARGOS - ESEX, USA, GIMI, CIV, SPADUS, HIRAAS, HTSSE II, EUVIP, CERTO (P91-1)												X
(U) STS-88 MightySat I, MSX, SIMPLEX												X

*New spaceflight opportunity since FY98PB.

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	56,456	51,501	32,582	37,400	39,561	37,535	38,272	Continuing	TBD
3321 Electronic Warfare Ground Test Resources	43,355	50,030	30,658	30,593	31,285	28,418	28,947	Continuing	TBD
2907 Electronic Combat Intel Support	1,724	1,471	1,924	1,974	2,022	1,936	1,972	Continuing	TBD
7500 Foreign Materiel Acquisition/Exploitation	0	0	0	4,833	6,254	7,181	7,353	Continuing	TBD
6510 Flight Test Resources	9,506	0	0	0	0	0	0	0	0
2900 Radar Target Scatter (RATSCAT) Upgrade	1,871	0	0	0	0	0	0	0	0
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This PE provides funding for the elements necessary to support the AF Electronic Warfare (EW) Test Process. This test process provides a scientific methodology to ensure the effective disciplined and efficient testing of AF EW and avionics systems. Each capability or facility improvement is pursued in concert with the others so as to avoid duplicate capabilities while at the same time producing the proper mix of test resources needed to support the AF EW Test Process. This PE provides funding for the management and technical oversight of implementation activities, the Air Force-led tri-Service effort to establish a common modeling and simulation architecture, measurement facilities operation and improvements, hardware in the loop test facilities operation and improvements, installed system test facility improvements, and development and improvement of open air threat simulators for flight testing. This PE also provides funding for planning, management, budgetary, and technical support to the Air Force for corporate-level implementation of the Electronic Warfare (EW) Test Process and for improvement and modernization (I&M) and application of the test and evaluation (T&E) infrastructure. Support includes requirements definition and analysis, project planning, programming and budgeting, technical oversight, and application of T&E facility I&M. Products include studies, analyses, and related documentation. This PE provides funding to support the acquisition and exploitation efforts of the Foreign Materiel Program, as well as to support EW intelligence efforts, beginning in FY 00. In FY 98, Projects 6510, Flight Test Resources, and 2900, RATSCAT Upgrade, were combined into Project 3321, Electronic Warfare Ground Test Resources, as part of consolidation and simplification efforts in T&E investment accounts. Contracts funded from this program are predominately awarded on the basis of full and open competition. This Program Element is in Budget Activity 6, Management and Support, because it is a Research and Development (R&D) effort for Improvement and Modernization of T&E capabilities at Air Force Test Centers.

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	53,496	51,846	36,238	Continuing
(U) Appropriated Value	55,435	54,346		
(U) Adjustments to Appropriated Value				
a. Cong Adjustments	-1,203	-2,139		
b. SBIR	-736	-706		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	3,100			
e. Rescissions	-140			
(U) Adjustments to Budget Years Since FY 1998 PB			-3,656	
(U) Current Budget Submit/FY 1999 President's Budget	56,456	51,501	32,582	Continuing

(U) Change Summary Explanation:

Funding:

FY 99:

Terminated AAIS (-5,119), JMASS models (3,300), minor adjustments (-1,837).

Schedule: None.

Technical: None.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)										DATE February 1998	
BUDGET ACTIVITY 6 - Management and Support					PE NUMBER AND TITLE 0604256F Threat Simulator Development						
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>											
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>	
Appropriation: Military Construction, Budget Activity: Defense-Wide Mission Support, 6 Program Title: Electronic Combat Integrated Test (ECIT)											
		4,900							N/A	16,000	
Appropriation: RDT&E Budget Activity: Defense-Wide Mission Support, 6 Program Title: Central Test and Evaluation Investment Program (CTEIP)											
		37,600	39,643	26,100					N/A	124,557	
Related RDT&E: (U) PE 0604759F, Major T&E Investment (U) PE 0604735F, Combat Training Ranges											
(U) D. <u>Schedule Profile</u>											
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3
(U) Real Time Electromagnetic Digitally Controlled Analyzer (REDCAP) Surveillance Radar Integration (Option C) Complete											
			X								
(U) JMASS Releases											
	X				X						
(U) ECIT Infrastructure and Generic Test Capability IOC											
										X	
(U) Digital Integrated Air Defense System Baseline IOC											
										X	
(U) AAIS Program Terminated											
					X						

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development	PROJECT 3321
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3321 Electronic Warfare Ground Test Resources	43,355	50,030	30,658	30,593	31,285	28,418	28,947	Continuing	TBD

(U) A. Mission Description and Budget Item Justification: The AF requires a comprehensive set of test facilities to implement the Air Force Electronic Warfare (EW) Test Process. In order that program risk can be managed effectively throughout the weapon system acquisition process, and test and evaluation (T&E) be conducted effectively and efficiently, a spectrum of T&E capabilities from modeling and simulation through open-air ranges is required. The EW Test Process Support task provides for investment management, coordinated technical oversight, and application of EW T&E facilities, including studies, analyses, and related documentation. The Joint Modeling and Simulation System (JMASS) is an Air Force-led, tri-service project to establish a common, DoD-wide, digital simulation architecture in support of T&E. The current JMASS program supports model development to meet the needs of the B-1B Defensive System Upgrade Program (DSUP). The JMASS project includes development of a limited set of threat and environment models to support acquisition and test of multiple programs including the B-1B, F-22, and Joint Strike Fighter (JSF). The Radar Target Scatter (RATSCAT) upgrade project provides improvements to the RATSCAT measurement facility at Holloman AFB, NM, to support radar cross section (RCS) measurement requirements of DoD customers. The Hardware in the Loop (HITL) test facilities evaluate electronic support and countermeasures effectiveness prior to installation on the aircraft. Together, the two AF HITL facilities, the Air Force Electronic Warfare Evaluation Simulator (AFEWES) and the Real Time Electromagnetic Digitally Controlled Analyzer and Processor (REDCAP), provide the ability to realistically evaluate hardware components against manned hardware threat representations early enough to affect final system design. FY98 is the last year of T&E infrastructure funding for operations at the government-owned-contractor-operated REDCAP facility in Buffalo, NY. In subsequent years, REDCAP test functions will transition to the Digital Integrated Air Defense System (DIADS) HITL at Edwards AFB, CA. The Electronic Combat Integrated Test (ECIT) project upgrades the AF Installed System Test Facility (ISTF) at Edwards AFB, CA. This ISTF consists of a large, instrumented, anechoic chamber which provides for evaluation of an EW system when installed on its host aircraft, both prior to and throughout the flight test program. The Advanced Airborne Interceptor Simulator (AAIS) is a project to develop an advanced signal system to represent airborne threats for EW open-air testing. In FY 98, Projects 6510, Flight Test Resources, and 2900, RATSCAT Upgrade, were combined into Project 3321, Electronic Warfare Ground Test Resources.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development	PROJECT 3321
(U) <u>FY 1997 (\$ in Thousands):</u>		
- (U) \$1,900	EW Test Process Support. Began implementation of the EW test facilities network. Continued the analysis and planning of upgrades to the network to improve implementation of the EW Test Process and support emerging EW technologies. Conducted assessment of AF test and training range requirements and capabilities.	
- (U) \$8,558	JMASS. Improved model and scenario development tools, such as visual programming, graphical user interface, hardware-in-the-loop and man-in-the-loop, and data management capabilities. Increased simulation speed. Increased the number of hardware platforms that JMASS can support. Supported a growing library of models, and provided user training, support and documentation. Released Generic Aircraft and Electronic Countermeasures (ECM) models along with upgraded surface-to-air missile (SAM) flyout models.	
- (U) \$2,832	AFEWES Operation and Upgrade. Continued AFEWES operation in support of Air Force, Army, Navy, and non-DoD test customers. Completed Infrared/Ultraviolet (IR/UV) laboratory upgrades. Began work on the Advanced Simulator Modification and the Track-While-Scan (TWS) 5 simulation.	
- (U) \$6,527	REDCAP Operation and Upgrade. Continued operation in support of Air Force, Army, Navy, and non-DoD test customers. Integrated Option C radar signature simulations into the Digital Integrated Air Defense System (DIADS) model. Developed Advanced C3 Upgrade and KC3 Upgrade. Began Advanced Command, Control and Communications (C3) Upgrade and KC3 Upgrade.	
- (U) \$18,792	ECIT. Continued development of infrastructure and generic EW and avionics installed system test capabilities. Completed preliminary design of the ECIT Infrastructure and Generic Test Capability (I>C).	
- (U) \$4,746	EC Test and Training Range Operations and Upgrade. Funded development of threat system simulators (emitters, signal sources, real world threat systems with instrumentation) and intelligence upgrades of existing systems to support Air Force Special Operations Command requirements.	
-(U)\$43,355	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
- (U) \$1,501	EW Test Process Support. Continue implementation of the EW test facilities network.	
- (U) \$9,469	JMASS. Improve JMASS capability by initiating and achieving IOC of Version 4. Adapt JMASS to a wider variety of computer platforms, including personal computers (PC). Increase JMASS efficiency by optimizing the architecture. Adapt commercial off-the-shelf (COTS) tools for front-end model development and post-processing viewing and analysis. Operate and maintain EW model library. Begin development and implementation of JMASS compliant models of surface-to-air missiles (SAMs), Air-to-Air Missiles (AAMs) and Airborne Interceptors (AIs) to support acquisition and test of multiple programs including the B-1, F-22, and Joint Strike Fighter (JSF).	
- (U) \$1,973	RATSCAT Upgrades. Integrate mobile Bistatic Coherent Measurement System (BICOMS) radar with BICOMS control and instrumentation infrastructure. Procure and begin integration of RATSCAT Advanced Measurement System (RAMS) radar replacement hardware.	
Project 3321	Page 5 of 15 Pages	Exhibit R-2 (PE 0604256F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0604256F Threat Simulator Development	3321
- (U) \$3,525	AFEWES Operation and Upgrade. Continue AFEWES operation in support of Air Force, Army, Navy, and non-DoD test customers. Continue Advanced RF and IR/UV HITL Simulator modifications. Upgrade the RF clutter environment to better simulate the open air range and integrate a semi-active SAM simulation into AFEWES.	
- (U) \$4,912	REDCAP/DIADS. Transition Integrated Air Defense System (IADS) HITL capability from REDCAP, Buffalo, NY, to the Air Force Flight Test Center (AFFTC) and establish Digital IADS (DIADS) HITL capability for support of Air Force, Army, Navy and non-DoD test customers. Complete development of Airborne Warning Model and Advanced C ³ Upgrade, and begin development of additional IADS configurations. Begin integration with ECIT.	
- (U) \$20,844	ECIT. Continue development and start procurement of infrastructure and generic EW and avionics installed system test capabilities. Complete Critical Design Review (CDR) of major I>C subsystems, including Network and Controls, Simulation, Radio Frequency (RF) Generation and Injection, RF Free Space Excitation, and Instrumentation.	
- (U) \$7,806	AAIS. Terminate program.	
-(U) \$50,030	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>		
- (U) \$400	EW Test Process Support. Conduct requirements analyses in support of Air Force investments in EW test infrastructure. Complete cost-benefit analysis of digital modeling and simulation (M&S) in support of the EW Test Process.	
-(U) \$11,436	JMASS. Complete development and achieve follow-on capability (FOC) of Version 4, which affords compatibility with the DoD High-Level Architecture (HLA). Complete transition of JMASS to PCs and other computer platforms. Complete architecture modification. Complete adaptation of COTS tools. Operate and maintain EW model library. Complete development and integration of JMASS-compliant SAM, AAM, and AI models to support the needs of a single customer. Develop additional threat models to support other DoD customers.	
-(U) \$1,928	RATSCAT Upgrades. Achieve IOC of BICOMS Mobile Radar. Integrate and achieve IOC of RAMS Radar Replacement.	
-(U) \$2,609	AFEWES Operation. Continue AFEWES operation in support of Air Force, Army, Navy, and non-DoD test customers. Complete development of semi-active SAM simulations, and begin development of Advanced Simulator Modifications.	
-(U) \$1,409	DIADS HITL. Begin DIADS support to Air Force, Army, Navy, and non-DoD test customers. Complete Verification and Validation (V&V) efforts required to achieve IOC of DIADS baseline. Begin development of external linking and BLUE IADS capabilities.	
-(U) \$12,876	ECIT. Complete development of the infrastructure and generic test capability. Begin integration with CTEIP-funded Generic Radar Target Generator (GRTG), Infrared Sensor Stimulator (IRSS), and Communications-Navigation-Identification (CNI) simulator.	
-(U) \$30,658	Total	
Project 3321	Page 6 of 15 Pages	Exhibit R-2 (PE 0604256F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE
BUDGET ACTIVITY		PE NUMBER AND TITLE		PROJECT
6 - Management and Support		0604256F Threat Simulator Development		3321
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	38,917	50,305	34,275	Continuing
(U) Appropriated Value	40,856	52,805		
(U) Adjustments to Appropriated Value				
a. Cong Adjustments	-601	-2,089		
b. SBIR		-686		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	3,100			
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-3,617	
(U) Current Budget Submit/FY 1999 President's Budget	43,355	50,030	30,658	Continuing
(U) Change Summary Explanation:				
Funding:				
<u>FY 99:</u>				
Terminated AAIS (-5,119), JMASS models (3,300), minor adjustments (-1,798).				
Schedule: None.				
Technical: None.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE			
BUDGET ACTIVITY							February 1998			
6 - Management and Support				PE NUMBER AND TITLE			PROJECT			
				0604256F Threat Simulator Development			3321			
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
Appropriation: Military Construction										
Budget Activity: Defense-Wide Mission Support, 6										
Program Title: Electronic Combat Integrated Test (ECIT)										
		4,900							N/A	16,000
Appropriation: RDT&E										
Budget Activity: Defense-Wide Mission Support, 6										
Program Title: Central Test and Evaluation Investment Program (CTEIP)										
		37,600	39,643	26,100					N/A	124,557
Related RDT&E:										
(U) PE 0604759F, Major T&E Investment										
(U) PE 0604735F, Combat Training Ranges										
(U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>				
		1	2	3	4	1	2	3	4	
(U) REDCAP Surveillance Radar Integration (Option C) Complete				X						
(U) JMASS Releases.	X			X						
(U) ECIT Infrastructure and Generic Test Capability (I>C) IOC								X		
(U) Digital Integrated Air Defense System Baseline IOC								X		
(U) AAIS Program Terminated				X						
Project 3321		Page 8 of 15 Pages					Exhibit R-2 (PE 0604256F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development	PROJECT 2907
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2907 Electronic Combat Intel Support	1,724	1,471	1,924	1,974	2,022	1,936	1,972	Continuing	TBD

(U) **A. Mission Description and Budget Item Justification** This project provides funding to support Foreign Materiel Operational Test and Evaluation (FMOT&E), which ensures the ability of operational commands to test and develop effective Electronic Attack/Electronic Protection (EA/EP) and tactics. Funds are required for: deployment of blue systems to test facilities, travel for personnel to the test sites to evaluate and validate test results real-time, reimbursement for industrial-funded range and laboratory costs; costs for instrumentation of blue systems; contracted engineering support for the conduct of tests and subsequent reporting. Funding for this program is required to prevent future aircraft losses due to improper and inaccurate aircrew tactics (e.g., lack of evasive action or proper tactics training to avoid missile attack).

(U) FY 1997 (\$ in Thousands):

- (U) \$1,400 Funded fighter and bomber testing for foreign material operational exploitation. Extensive evaluations and reporting was accomplished.
- (U) \$ 280 Funded transport aircraft for foreign material operational exploitation. Extensive evaluations and reporting was accomplished.
- (U) \$ 44 Funded classified assessments for foreign material operational exploitation. Extensive evaluations and reporting was accomplished.
- (U) \$1,724 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$1,180 Funds fighter and bomber testing for foreign material operational exploitation. Extensive evaluations and reporting to be accomplished.
- (U) \$ 250 Funds transport aircraft for foreign material operational exploitation. Extensive evaluations and reporting to be accomplished.
- (U) \$ 41 Funds classified assessments for foreign material operational exploitation. Extensive evaluations and reporting was accomplished.
- (U) \$1,471 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$1,561 Funds fighter and bomber testing for foreign material operational exploitation. Extensive evaluations and reporting to be accomplished.
- (U) \$ 300 Funds transport aircraft for foreign material operational exploitation. Extensive evaluations and reporting to be accomplished.
- (U) \$ 63 Funds classified assessments for foreign material operational exploitation. Extensive evaluations and reporting was accomplished.
- (U) \$1,924 Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development			PROJECT 2907
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	1,795	1,541	1,963	Continuing
(U) Appropriated Value	1,795			
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-71	-50		
b. SBIR		-20		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-39	
(U) Current Budget Submit/FY 1999 President's Budget	1,724	1,471	1,924	Continuing
(U) Change Summary Explanation:				
Funding: Minor adjustments in FY 1998 and in FY 1999.				
Schedule: None.				
Technical: None.				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) D. <u>Schedule Profile:</u> Not applicable.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development	PROJECT 7500
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
7500 Foreign Materiel Acquisition/Exploitation	0	0	0	4,833	6,254	7,181	7,353	Continuing	TBD

(U) A. **Mission Description and Budget Item Justification:** This project is established for the specific purpose of supporting the USAF Foreign Materiel Program in the acquisition and exploitation of foreign materiel. Items considered for these Foreign Materiel Acquisition and Exploitation (FMA&E) funds are included in the prioritized Air Force Foreign Materiel Acquisition (FMA) list established each year and are not eligible for OSD FMA&E funds. The USAF FMA list is established annually by Major Command representatives using specific criteria and a well-established process. The draft list is then approved by each Major Command and final approval comes from the Air Force Vice Chief of Staff. Exploitations are based on and driven by acquisitions.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development	PROJECT 6510
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
6510 Flight Test Resources	9,506	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification** The AF requires a comprehensive set of test facilities to implement the Air Force Electronic Warfare (EW) Test Process. In order that program risk can be managed effectively throughout the weapon system acquisition process, and test and evaluation (T&E) be conducted effectively and efficiently, a spectrum of T&E capabilities from modeling and simulation through open-air ranges is required. The Advanced Airborne Interceptor Simulator (AAIS) project initiated development of an advanced signal system to represent airborne threats for EW open-air testing. In FY 98, Projects 6510, Flight Test Resources, and 2900, RATSCAT Upgrade, were combined into Project 3321, Electronic Warfare Ground Test Resources.

(U) FY 1997 (\$ in Thousands):

- (U) \$5,800 Completed AAIS radar and communication equipment design.
- (U) \$2,606 Began AAIS radar and communication equipment fabrication
- (U) \$1,100 Began preparation for AAIS integration/testing phases.
- (U) \$9,506 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Not applicable.

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Not applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0604256F Threat Simulator Development			PROJECT 6510			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total Cost</u>				
(U) Previous President's Budget (FY 1998 PB)		10,836				N/A				
(U) Appropriated Value		10,836								
(U) Adjustments to Appropriated Value										
a. Cong Reductions		-454								
b. SBIR		-736								
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming										
e. Rescissions		-140								
(U) Adjustments to Budget Years Since FY 1998 PB										
(U) Current Budget Submit/FY 1999 President's Budget		9,506				N/A				
(U) Change Summary Explanation:										
Funding: None.										
Schedule: None.										
Technical: None.										
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
Appropriation: RDT&E		6,400							N/A	6,400
Budget Activity: Defense-Wide Mission Support,										
6 Program Title: Central Test and Evaluation										
Investment Program (CTEIP)										
(U) D. <u>Schedule Profile:</u> Not applicable										
Project 6510			Page 13 of 15 Pages				Exhibit R-2 (PE 0604256F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development	PROJECT 2900
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2900 Radar Target Scatter (RATSCAT) Upgrade	1,871	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification** This project provides improvements to the Radar Target Scatter (RATSCAT) facility in order to assure support to address radar cross section (RCS) measurement requirements of DoD customers. Key areas of improvement complement and support the existing stand-alone Central Test and Evaluation Improvement Program (CTEIP) funded program and include radar upgrades standardization of data processing equipment and techniques, bistatic testing, pylon background reduction, low frequency measurement capability upgrades, and efficiency related equipment. The DoD continues an aggressive R&D program to achieve low observable technology. This project provides a continuous effort to allow test technology to keep pace with these activities. In FY 98, Projects 6510, Flight Test Resources, and 2900, RATSCAT Upgrade, were combined into Project 3321, Electronic Warfare Ground Test Resources.

(U) FY 1997 (\$ in Thousands):

- (U) \$1,871 RATSCAT Upgrades. Completed procurement of DAPS for Mainsite. Continue design and procurement of BICOMS radar systems.
- (U) \$1,871 Total

(U) FY 1998 (\$ in Thousands):

- (U) Not applicable.

(U) FY 1999 (\$ in Thousands):

- (U) Not applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604256F Threat Simulator Development	PROJECT 2900		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	1,948			Continuing
(U) Appropriated Value	1,948			
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-77			
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) Current Budget Submit/FY 1999 President's Budget	1,871			Continuing
(U) Change Summary Explanation:				
Funding: None.				
Schedule: None.				
Technical: None.				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) D. <u>Schedule Profile</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	
	1 2 3	4 1 2 3	4 1 2 3	4
(U) DAPS Procured		X		
(U) BICOMS Mobile Radar Procured		X		
Project 2900				
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604258F Target Systems Development	PROJECT 2459
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2459 Target Payloads	4,626	4,491	1,666	195	196	198	199	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Aerial Targets are used to determine air-to-air weapons effectiveness and mission proficiency of our tactical systems against enemy aircraft. The overall objective is to improve air-to-air weapons systems accuracy and reliability by developing improved aerial target systems for Air Force weapons system test and evaluation. Specialized target payload subsystems are developed for full-scale and subscale targets for missile scoring, electronic and infrared (IR) countermeasures, and radar and IR signature augmentation. An Interim Vector Scoring (IVS) system is being produced to provide missile path and position relative to the target at point of closest approach, essential to accurately calculate the probability of a kill. Electronic and infrared countermeasures being developed include chaff and flare dispenser systems. IR signature augmentation systems are developed for subscales to provide a signature representative of threat military jet engines. The Drone Radio Frequency (RF) Electronic Enhancement Mechanism (DREEM) is being developed to provide subscale radar cross section (RCS) enhancement to replicate full size threat aircraft, and will be used for Developmental Test and Evaluation/Initial Operational Test and Evaluation of air-to-air missiles, air-to-air Weapons System Evaluation Program (WSEP). This program also provided for the development of the QF-4E Full Scale Aerial Target. This program is in budget activity 6 - Management Support because it provides overall support to research and development activities.

(U) Acquisition Strategy:

The acquisition strategy is competitive, cost plus contracts.

(U) FY 1997 (\$ in Thousands):

- (U) \$16 IVS Contractor Support
- (U) \$33 IVS International Range Instrumentation Group (IRIG) Timing Card Upgrade
- (U) \$15 IVS Encryption Upgrade
- (U) \$30 BQM-34 NICAD Battery Development
- (U) \$1,785 Continued DREEM Demonstration/Validation (DEMVAL)
- (U) \$208 Continued MQM-107E Signal Processor Vehicle Interface/Digital Autopilot (SPVI/DAP) Integrated Flight Controller (IFC) Development / Advanced Maneuvers
- (U) \$152 SPVI/DAP Integrated Flight Controller (IFC) Software Development
- (U) \$467 Integrated POD Capabilities
- (U) \$ 5 Hardware/Software for Tech Order Writing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0604258F Target Systems Development	2459
<ul style="list-style-type: none"> - (U) \$128 QF-106 Canceled Year Liability - (U) \$35 Adapt MQM-107E to carry Electronic Countermeasures/Infra-red Countermeasures (ECM/IRCM) Payloads - (U) \$200 Vector Doppler Scorer (VDOPS) Ground Standard Processor Upgrade - (U) \$70 Non-linear Trajectory Upgrade - (U) \$34 Gulf Range Drone Control Upgrade System (GRDCUS) Pod II Global Positioning System (GPS) Software Upgrade - (U) \$120 AF Development Test Center (AFDTC/DR) - Target Requirements Support - (U) \$76 Test and Acquisition Management Support (TAMS) - Test Support - (U) \$50 Super MQM Demonstration - (U) \$1 MQM-107D Water Recovery Demonstration - (U) \$20 DREEM Development Test and Evaluation (DT&E) - (U) \$1,181 Support & Management - (U) \$4,626 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,113 Continue DEMVAL for DREEM - (U) \$80 Continue to Adapt MQM-107E to carry ECM/IRCM Payloads - (U) \$282 IFC Advanced Maneuver - (U) \$188 DREEM Feasibility Study (Near Field) - (U) \$188 AFDTC/DR - Target Requirements Support - (U) \$1,170 Support & Management - (U) \$94 TAMS Test Support - (U) \$376 DREEM DT&E - (U) \$4,491 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$200 Target Reliance Technical Support - (U) \$120 DREEM Feasibility Study (Near Field) - (U) \$1006 Support & Management - (U) \$50 TAMS Test Support - (U) \$290 DREEM DT&E - (U) \$1,666 Total 		
Project 2459	Page 2 of 4 Pages	Exhibit R-2 (PE 0604258F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0604258F Target Systems Development			PROJECT 2459			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>				
						<u>Cost</u>				
(U)	Previous President's Budget	4,762	4,780	4,818		Cont				
(U)	Appropriated Value	4,966	4,780							
(U)	Adjustments to Appropriated Value									
	a. Cong Reductions	-119	-228							
	b. SBIR	-85	-61							
	c. Omnibus or Other Above Threshold Reprogram									
	d. Below Threshold Reprogramming	-128								
	e. Rescissions	-8								
(U)	Adjustments to Budget Years Since FY 1998 PB			-3,152						
(U)	Current Budget Submit/1999 Presidents Budget	4,626	4,491	1,666		Cont				
(U) Change Summary Explanation:										
	Funding: FY97 (-\$128K) used to source an FY89 cancelled year bill									
	FY99 decreased to fund higher Air Force priorities (-\$3,118K) and due to an inflation adjustment (-\$34K)									
	Schedule: None									
	Technical: None									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U)	PE35116F: Appropriation: Missile Procurement, AF Budget Activity: 2 Program Title: Target Drones									
	WSC: MQM107 (MQM-107E)	13,303	4,472	13,821	20,545	22,084	22,440	22,692	Cont	Cont
	WSC: M04AQF (QF-4)	17,717	20,540	22,442	17,237	16,735	16,645	16,831	Cont	Cont
	Spares: BQM-34, QF-4, MQM-107, QF-106	1,904	1,089	2,570	3,412	3,451	3,590	3,647	Cont	Cont
Project 2459		Page 3 of 4 Pages				Exhibit R-2 (PE 0604258F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604258F Target Systems Development	PROJECT 2459
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Full-Scale Aerial Target Systems												
(U) QF-4												
- IOC		*										
- First Delivery (Lot 2)			*									
- Production Options (Lot 3)			*									
- First Delivery (Lot 3)								X				
- Follow-on QF-4 Production Options						X				X		
(U) Target Payloads												
(U) DREEM												
- Contract Award 3/96												
- Factory Testing						X		X				
- Ground Testing								X		X		
- Flight Testing										X		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604759F Major Test And Evaluation Investment
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	29,440	53,364	34,518	48,180	57,295	51,313	48,028	Continuing	TBD
4597 (U) Air Force Test Investments	0	53,364	34,518	48,180	57,295	51,313	48,028	Continuing	TBD
3120 Air Force Development Test Center	8,306	0	0	0	0	0	0	Continuing	TBD
3285 Arnold Engineering Development Center	5,125	0	0	0	0	0	0	Continuing	TBD
3620 Air Force Flight Test Center	16,009	0	0	0	0	0	0	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program element provides planning, improvements, and modernization for test capabilities at three Air Force Test Centers: Arnold Engineering Development Center (AEDC), Air Force Development Test Center (AFDTC), and Air Force Flight Test Center (AFFTC). The purpose is to help test centers keep pace with emerging weapon system technologies. Test investment activities are also funded at the Space and Missile Systems Center Test Directorate (SMC/TE) and the Joint Program Office (JPO) for Test and Evaluation (T&E). The fluctuations in the funding at these locations are due to changing priorities in the improvement and modernization requirements as defined through the AF Test Investment Planning & Programming. Also, all projects have been reviewed through the Tri-Service Reliance effort (to communicate AF efforts to the other services and avoid unwarranted duplication of effort) and are documented in the Test Capability Master Plans. Further, each project has its own planning, development, equipment acquisition/facility construction, equipment installation, and checkout phases which often requires significant differences in funding from one year to the next. As such, the changes in funding from year to year do not necessarily indicate program growth but rather a planned phasing of improvement and modernization efforts. The test capabilities at these centers enable testing through all phases of weapon system acquisition from system concept exploration through component and full scale integrated weapon system testing to operational testing. These three test centers have over \$10 billion worth of unique test facilities/capabilities. They are a national asset operated and maintained by the Air Force for DoD test and evaluation missions, but they are available to others having a requirement for their unique capabilities. Beginning in FY98, T&E investments are consolidated into one project (4597) to properly reflect that Air Force investments are determined at the component and DoD level. Prior to FY98 investments were reflected by test center and led to misperceptions that investment planning was geographically determined. This Program Element is in Budget Activity 6, Management and Support, because it is a Research and Development (R&D) effort for Improvement and Modernization of T&E capabilities at Air Force Test Centers.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																		
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604759F Major Test And Evaluation Investment																																																			
<p>(U) <u>Acquisition Strategy:</u> This program element uses several different contracting strategies to provide the most cost effective T&E investment solutions. The main acquisition strategy is to use full and open competition wherever possible to improve and modernize existing test capabilities.</p> <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB):</td> <td style="text-align: right;">32,340</td> <td style="text-align: right;">47,336</td> <td style="text-align: right;">43,809</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">33,529</td> <td style="text-align: right;">56,336</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td style="text-align: right;">-735</td> <td style="text-align: right;">-2,197</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-454</td> <td style="text-align: right;">-775</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: right;">-2,900</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-9,291</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">29,440</td> <td style="text-align: right;">53,364</td> <td style="text-align: right;">34,518</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: FY 99: Program content reduced or slipped due to budget constraints. Schedule: In some cases program(s) was delayed from three months to one year. Technical: None.</p> <p>(U) <u>C. Other Program Funding Summary (\$ in Thousands)</u></p> <p>Related RDT&E: (U) PE 0604940D, Central Test & Evaluation Improvement Program (U) PE 0604256F, Threat Simulator Development (U) PE 0604735F, Combat Training Ranges</p> <p>(U) <u>D. Schedule Profile:</u> This PE contains multiple schedule profiles which are available upon request.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB):	32,340	47,336	43,809	Continuing	(U) Appropriated Value	33,529	56,336			(U) Adjustments to Appropriated Value					a. Cong Reductions	-735	-2,197			b. SBIR	-454	-775			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	-2,900				(U) Adjustments to Budget Years Since FY 1998 PB			-9,291		(U) Current Budget Submit/FY 1999 President's Budget	29,440	53,364	34,518	Continuing
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																
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(U) Current Budget Submit/FY 1999 President's Budget	29,440	53,364	34,518	Continuing																																																
<i>Page 2 of 14 Pages</i>		<i>Exhibit R-2 (PE 0604759F)</i>																																																		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0604759F Major Test And Evaluation Investment				PROJECT 4597		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
4597 (U) Air Force Test Investments	0	53,364	34,518	48,180	57,295	51,313	48,028	Continuing	TBD	
<p>(U) A. <u>Mission Description and Budget Item Justification</u> AFDTC, located at Elgin AFB, FL, conducts and supports developmental test and evaluation and operational test and evaluation of non-nuclear air armaments, C⁴I systems, and target acquisition and weapon delivery systems; provides a climatic simulation capability; and determines target/test item spectral signatures. The Guided Weapon Evaluation Facility (GWEF) provides a full spectrum, multifunctional seeker/sensor laboratory test capability for all guided weapons. Common Airborne Instrumentation System (CAIS) Integration provides standardized airborne test instrumentation to enhance interoperability and commonality. Global Positioning System (GPS) Range Systems will provide a major improvement for Time-Space-Position-Information (TSPI) at all Major Range and Test Facility Bases (MRTFB) and specifically at the Eglin Ranges for munitions testing. Command, Control, Communications, Computers and Intelligence (C⁴I) Test Capabilities Upgrade will provide connectivity to existing capabilities and add needed networks and hardware to develop a C⁴I test bed. The Preflight Integration of Munitions and Electronic Systems (PRIMES) facility conducts preflight test and evaluation of total integrated weapon systems in a secure anechoic chamber. The Armament Systems Test Environment (ASTE) Range Systems effort upgrades instrumentation of the major data collection systems supporting open air testing. The Climatic Test Facility modernization of instrumentation and environmental capabilities supports the military construction upgrade, extending its useful life to 2015. Mission Control/Data Analysis provides for real-time central mission control and analysis. Multispectral Missile Engagement Hardware-in-the-Loop (HITL) Test provides a capability to support multiple and wide field-of-view missile engagements incorporating multispectral stimulations. The Santa Rosa Island Reconstitution effort will provide hardware-in-the-loop equipment for three focus sites to support armament/munitions and C4I testing. These projects ensure test center technology is compatible with weapon systems to be tested such as AMRAAM, JDAM, AGM-130, ASRAAM, JTIDS, JSTARS, Combat Talon, etc.</p> <p>AEDC, located at Arnold AFB, TN, provides ground environmental test support for DoD aeronautical, missile, and space programs. The center has 53 test facilities providing: aerodynamic testing of scale model aircraft, missile, and space systems; testing of large and full-scale satellites, sensors, and space vehicles in a simulated space environment; altitude environmental testing for aircraft, missile, and spacecraft propulsion systems; and testing of large-scale models such as space boosters together with their propulsion systems. The AEDC Data Acquisition and Processing System (DAPS) provides processing capability for advanced turbine engine testing on programs like the F-22. This effort also upgrades data systems for the arc heaters and hypervelocity gun facility for Theater High Altitude Air Defense (THAAD) testing. Inefficiencies in these current data systems result in increased program costs and schedule delays. The Computer Aided Modernization Project (CMP) will provide increased capability for data processing and storage and provide wider availability of workstations. The Propulsion Wind Tunnel (PWT) Sustainment project sustains long-term operation of tunnels 16T and 16S to meet transonic/supersonic test needs. The Improve Turbine Engine Structural Integrity project will provide new state-of-the-art structural test monitoring and data analysis systems to support turbine engine structural tests to detect and analyze high cycle fatigue.</p>										
Project 4597			Page 3 of 14 Pages			Exhibit R-2 (PE 0604759F)				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0604759F Major Test And Evaluation Investment	4597
<p>AFFTC, located at Edwards AFB, CA conducts and supports developmental test and evaluation and operational test and evaluation of aircraft and aircraft systems, aerospace research vehicles, unmanned miniature vehicles, cruise missiles, parachutes delivery/recovery systems, and cargo-handling systems. The AF Common Airborne Instrumentation System (CAIS) Integration & Support (I&S) supports DoD objectives for interoperability/commonality. The goal of CAIS I&S is to integrate CAIS equipment and supporting instrumentation equipment and systems to provide a full airborne instrumentation operational capability. The Advanced Data Acquisition and Processing Systems (ADAPS) project provides an integrated capability to satisfy real-time first generation post-test data processing, archival, and display requirements of the next decade. The developmental approach is directed towards providing a high degree of interoperability between systems and components by adherence to Air Force and DoD guidelines. The technologies being developed under ADAPS have the potential to satisfy data processing and display needs at various multi-service test ranges. The Space Based Data Relay (SBDR) project provides the capability for Advanced Range Instrumentation Aircraft (ARIA) to fulfill customer needs for real time, high-speed data, and greatly improve the overall range data relay capability. The Flight Simulator Modernization project will upgrade the Test and Evaluation Modeling and Simulation (TEMS) facility to meet future man-in-the loop simulator requirements. The Linked Interactive T&E Networking (LITENING) project will provide the network infrastructure necessary to support inter-range simulations and support the efficient transmission of flight test data to various facilities for processing and analysis.</p> <p>SMC/TE located at Kirtland AFB, NM is responsible for test planning and implementation for all space and ballistic missile systems. The Combined Space Test Task Force project will provide the capability to develop and test new satellites and ground control systems.</p> <p>Beginning in FY98, T&E investments are consolidated into one project (4597) to properly reflect that Air Force investments are determined at the component and DoD level. Prior to FY98 investments were reflected by test center and led to misperceptions that investment planning was geographically determined.</p> <p><u>(U) Acquisition Strategy:</u> This program element uses several different contracting strategies to provide the most cost effective T&E investment solutions. The main acquisition strategy is to use full and open competition wherever possible to improve and modernize existing test capabilities.</p> <p><u>(U) FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$0 Not applicable. <p><u>(U) FY 1998 (\$ in Thousands):</u></p> <p>Air Force Development Test Center (AFDTC)</p> <ul style="list-style-type: none"> - (U) \$4,924 Continue CAIS integration, procure CAIS production units, and continue procurement of support equipment. - (U) \$1,854 C⁴I Test Capabilities Upgrade. Continue the acquisition of workstations, network connections, and processing hardware/software. Begin secure facility upgrades. - (U) \$3,484 GWEF. Continue development of the expanded radar simulator and the midwave infrared (IR) simulator. Begin aircraft/munitions modeling and simulation. - (U) \$1,123 Continue GPS integration on the range and Central Control Facility. Begin acquisition of a translator/processor system. - (U) \$1,643 PRIMES. Acquire a Communication-Navigation-Identification(CNI) simulator, upgrade the GPS simulator and begin the munitions interface simulations. 		
Project 4597	Page 4 of 14 Pages	Exhibit R-2 (PE 0604759F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		February 1998
6 - Management and Support	PE NUMBER AND TITLE	PROJECT
	0604759F Major Test And Evaluation Investment	4597
- (U) \$1,371	ASTE Range Systems. Begin upgrades to TSPI systems, timing, telemetry, microwave, communications, arenas, gun test, photo-optics, and fiber optics.	
- (U) \$9,300	Santa Rosa Island Reconstitution. Begin development of three focus sites to provide open air Hardware-in-the-Loop (HITL) capability.	
	Arnold Engineering Development Center (AEDC)	
- (U) \$2,440	Continue AEDC DAPS with acquisition and installation of additional workstations/processors in engine test cells. IOC of C1/C2 test cells.	
- (U) \$1,263	Continue purchase of CMP workstations (design fourth increment). Continue to implement the AEDC Reengineering Computer Base.	
- (U) \$8,270	Begin PWT Sustainment projects. Begin design and procurement of PWT data acquisition and processing systems. Start requirements planning for flow quality and electric motor repower improvements.	
- (U) \$1,890	Begin Hypersonic Wind Tunnel Design Study. Issue study contracts for requirements definition and program planning.	
	Air Force Flight Test Center (AFFTC)	
- (U) \$6,087	CAIS I&S development. Purchase CAIS components for AFFTC use. Continue TIMS development with automated setup of systems, automated diagnostics, and simulation capability. Begin development of an on-board processing capability.	
- (U) \$3,346	ARIA Space Based Data Relay. Complete the communications portion of the SBDR program for 3 aircraft. Continue hardware/software integration of the SBDR subsystems upgrades for a 3 aircraft fleet.	
- (U) \$6,034	Continue integration of ADAPS with ground test simulation capabilities. Begin marketing capabilities to support multiple flight test missions including Tri-Service Operational flight tests. Develop capability to increase test data flow throughput and decrease flight test mission turnaround time. IOC of AFFTC Post Test Analysis System and Auxiliary Processing and Analysis System.	
	Other Projects	
- (U) \$ 335	Continue Joint Program Office T&E support activities.	
- (U) \$53,364	Total	
(U) <u>FY 1999 (\$ in Thousands):</u>	Air Force Development Test Center	
- (U) \$2,254	Continue CAIS integration, procure CAIS production units, and continue procurement of support equipment.	
- (U) \$ 724	C ⁴ I Test Capabilities Upgrade. Continue the acquisition of workstations, network connections, and processing hardware/software. Complete secure facility upgrades.	
- (U) \$2,553	GWEF will complete the expanded radar simulator and midwave IR simulator. Begin development of the multispectral man-in-the-loop and the active laser simulator. Continue aircraft/munitions modeling and simulation.	
- (U) \$2,228	Continue GPS integration and complete the acquisition of translator/processor system.	
- (U) \$1,656	PRIMES. Begin the aircraft/munitions interface simulations. Complete the CNI simulator data link and acquire an F-15/APG 63-V1 radar interface.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		February 1998
6 - Management and Support	PE NUMBER AND TITLE	PROJECT
	0604759F Major Test And Evaluation Investment	4597
- (U) \$1,789	ASTE Range Systems. Continue upgrades to TSPI systems, telemetry, microwave, communications, arenas, gun test, and photo-optics.	
- (U) \$1,053	Mission Control/Data Analysis. Begin procurement of data acquisition equipment and real-time TM equipment.	
- (U) \$1,972	The Multispectral Missile Engagement HITL Test Capacity. Begin acquisition of a target generator and development of target and clutter models.	
	Arnold Engineering Development Center	
- (U) \$1,084	AEDC DAPS. Complete installation of the J4 rocket test cell DAPS. IOC of J1/J2 test cell portion of DAPS.	
- (U) \$1,078	Continue purchase of CMP workstations. Continue to implement the AEDC Reengineering Computer Base.	
- (U) \$4,560	PWT Sustainment. Continue installation of data acquisition and processing system in 16T and 16S tunnels. Continue installation of 16T/16S pre-test checkout system. Begin design of plant control systems. Continue planning for flow quality and electric motor repower improvements.	
- (U) \$ 871	Improve Turbine Engine Structural Integrity. Begin design and procurement of aeromechanical test hardware and development of data analysis techniques.	
	Air Force Flight Test Center	
- (U) \$3,820	CAIS I&S development. Finish rehost of Test Instrumentation Management System (TIMS) to Windows NT platform and improve TIMS with automated setup of systems, automated diagnostics, and simulation capability. Continue development of an on-board processing capability. Begin development of an advanced solid state recorder.	
- (U) \$5,541	ADAPS. Continue to integrate simulation system with real-time data analysis capability. Begin development of desktop simulation capability. Continue to provide the traditional structures & flutter post-test analysis capability in near real-time in the Ridley Mission Control Rooms. Continue to provide post test analysis capabilities for flight testing. Provide avionics data processing in near real-time in the Ridley Mission Control Rooms. Finish real-time development.	
- (U) \$1,225	Flight Simulation Modernization. Begin the upgrade of the Test and Evaluation Modeling and Simulation (TEMS) facility to meet future man-in-the-loop simulator requirements for programs such as the Joint Strike Fighter (JSF). Procure hardware to support the development of a reconfigurable Air Warfare Mission Simulator (AWMS) cockpit simulator.	
- (U) \$ 780	Linked Interactive T&E Networking. Begin development of AFFTC high-speed network to link test capabilities such as Electronic Combat Integrated Test (ECIT). Develop connectivity to the Defense Research Engineering Network (DREN).	
	Other Projects	
- (U) \$ 350	Continue Joint Project Office T&E support activities.	
- (U) \$ 980	Combined Space Test Task Force. Begin procurement of hardware and software to complete evaluations of on-orbit R&D satellites and technologies. Begin development of a satellite command and control database and models.	
- (U) \$34,518	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE
BUDGET ACTIVITY		PE NUMBER AND TITLE		PROJECT
6 - Management and Support		0604759F Major Test And Evaluation Investment		4597
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB):	0	47,336	43,809	Cont
(U) Appropriated Value		56,336		
(U) Adjustments to Appropriated Value				
a. Cong Reductions		-2,197		
b. SBIR		-775		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1998 PB			-9,291	
(U) Current Budget Submit/FY 1999 President's Budget	0	53,364	34,518	Cont
 (U) Change Summary Explanation:				
Funding:				
Funding: FY 99:				
Climatic Test Facility upgrade cancellation			-797	
Advanced Range Instrumentation Aircraft Space-based Data				
Relay/Recording and Timing System Upgrade cancellation			-1,731	
Common Airborne Instrumentation System (reduced quantity)			-1,376	
Guided Weapon Evaluation Facility (delayed instrumentation upgrade one year)			- 631	
C4I Test Capability Upgrade (delayed instrumenation development)			-1,215	
Computer-aided modification program (delayed development one year)			- 911	
Improved Turbine Engine Structural Integrity			-1,521	
Miscellaneous T&E reductions to thirteen other T&E investment programs			-1,109	
Schedule: Each affected program was delayed from three months to one year.				
Technical: None.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0604759F Major Test And Evaluation Investment	4597
<p>(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> None</p> <p>Related RDT&E: (U) PE 0604256F, Threat Simulator Development (U) PE 0604940D, Central Test and Evaluation Investment Program</p> <p>(U) D. <u>Schedule Profile:</u> This PE contains multiple schedule profiles which are available upon request.</p>		
Project 4597	Page 8 of 14 Pages	Exhibit R-2 (PE 0604759F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604759F Major Test And Evaluation Investment	PROJECT 3120
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3120 Air Force Development Test Center	8,306	0	0	0	0	0	0	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	

(U) **A. Mission Description and Budget Item Justification:** AFDTTC, located at Elgin AFB, FL, conducts and supports developmental test and evaluation and operational test and evaluation of non-nuclear air armaments, C⁴I systems, and target acquisition and weapon delivery systems; provides a climatic simulation capability; and determines target/test item spectral signatures. The Guided Weapon Evaluation Facility (GWEF) provides a full spectrum, multifunctional seeker/sensor laboratory test capability for all guided weapons. Common Airborne Instrumentation System (CAIS) Integration provides standardized airborne test to enhance interoperability and commonality. GPS Range Systems will provide a major improvement for Time-Space-Position-Information (TSPI) at all MRTFBs and specifically at the Elgin Ranges for munitions testing. Command, Control, Communications, Computers and Intelligence (C⁴I) Test Capabilities Upgrade will provide connectivity to existing capabilities and add needed networks and hardware to develop a C⁴I test bed. These projects ensure test center technology is compatible with weapon systems to be tested such as AMRAAM, JDAM, AGM-130, ASRAAM, JTIDS, JSTARS, Combat Talon, etc.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,505 Continued CAIS integration, procure CAIS production units, and continue procurement of support equipment for bench, laboratory, and preflight.
- (U) \$1,410 C⁴I Test Capabilities Upgrade. Began procurement of workstations, network connections, and hardware/software for a classified C⁴I test capability.
- (U) \$2,965 GWEF. Completed the multimode project and continued the expanded radar simulator.
- (U) \$1,426 Continued procurement of GPS instrumentation for surface and airborne TSPI.
- (U) \$8,306 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Not applicable.

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Not applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604759F Major Test And Evaluation Investment	PROJECT 3120
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	9,206	0	0	Continuing
(U) Appropriated Value	9,405			
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-199			
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-900			
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) Current Budget Submit: FY 1999 PB	8,306	0	0	Continuing
(U) Change Summary Explanation:				

Funding: None.
Schedule: None.
Technical: None.

(U) C. Other Program Funding Summary (\$ in Thousands): None

(U) D. Schedule Profile: This PE contains multiple schedule profiles which are available upon request.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0604759F Major Test And Evaluation Investment	PROJECT 3285
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3285 Arnold Engineering Development Center	5,125	0	0	0	0	0	0	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification** AEDC, Arnold AFB, TN, provides ground environmental test support for DoD aeronautical, missile, and space programs. The center has 53 test facilities providing: aerodynamic testing of scale model aircraft, missile, and space systems; testing of large and full-scale satellites, sensors, and space vehicles in a simulated space environment; altitude environmental testing for aircraft, missile, and spacecraft propulsion systems; and testing of large-scale models such as space boosters together with their propulsion systems. The AEDC Data Acquisition and Processing System (DAPS) provides processing capability for advanced turbine engine testing on programs like the F-22. This effort also upgrades data systems for the arc heaters and hypervelocity gun facility for Theater High Altitude Air Defense (THAAD) testing. Inefficiencies in these current data systems result in increased program costs and schedule delays. The Computer Aided Modernization Project (CMP) will provide increased capability for data processing and storage and provide wider availability of workstations. The Fighter Engine Test Capability will upgrade turbine engine test cells to accommodate higher thrust engines, and upgrade J-2 test cell with Exhaust Gas Management System for axisymmetric vectored exhaust nozzles.

(U) FY 1997 (\$ in Thousands):

- (U) \$3,583 Continued AEDC DAPS with acquisition and installation of additional work stations/processors in the engine test cells. IOC ASTF and J4 rocket test cell portions of DAPS.
- (U) \$1,304 Continued purchase of CMP workstations (design third increment). Continued training of personnel.
- (U) \$ 238 Completed fighter engine test capability upgrade.
- (U) \$5,125 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Not applicable.

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Not applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0604759F Major Test And Evaluation Investment				PROJECT 3620		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
3620 Air Force Flight Test Center	16,009	0	0	0	0	0	0	Continuing	TBD	
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	
<p>(U) A. <u>Mission Description and Budget Item Justification</u> AFFTC, located at Edwards AFB, conducts and supports developmental test and evaluation and operational test and evaluation of aircraft and aircraft systems, aerospace research vehicles, unmanned miniature vehicles, cruise missiles, parachutes delivery/recovery systems, and cargo-handling systems. The AF Common Airborne Instrumentation System (CAIS) Integration & Support (I&S) supports DoD objectives for interoperability/commonality. The goal of CAIS I&S is to integrate CAIS equipment and supporting instrumentation equipment and systems to provide a full airborne instrumentation operational capability. The Advanced Data Acquisition and Processing Systems (ADAPS) project provides an integrated capability to satisfy real-time first generation post-test data processing, archival, and display requirements of the next decade. The developmental approach is directed towards providing a high degree of interoperability between systems and components by adherence to Air Force and DoD guidelines. The technologies being developed under ADAPS have the potential to satisfy data processing and display needs at various multi-service test ranges. The AF Global Positioning System Range Applications Joint Program Office (GPS RAJPO) Equipment project provides funding for the purchase of production GPS equipment developed by the RAJPO (OSD funded) for tri-service application. The Space Based Data Relay (SBDR) project provides the capability for ARIA to fulfill customer needs for real time, high-speed data, and greatly improve the overall range data relay capability. The ARIA Extended S-Band Telemetry upgrade ensures the compatibility of the ARIA with the Expendable Launch Vehicles (ELV) and major DoD ranges.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5,941 Continued ARIA Space Based Data Relay program. Continued equipment installation/fabrication and #2 aircraft modification. - (U) \$3,210 Continued CAIS I&S development. Purchased CAIS components for AFFTC use. Continued TIMS development with automated setup of systems, automated diagnostics, and simulation capability. Began development of a CAIS optical bus interface unit. - (U) \$ 880 Completed purchase of RAJPO GPS equipment. - (U) \$5,329 IOC of ADAPS Real-Time /Post-Flight Processing (RT/PFP). Conducted user, operator, & maintenance training. Continued development of the AFFTC Post Test Analysis System (APTAS) and the Auxiliary Processing and Analysis System (APAS). Began GTI requirements studies and analysis. - (U) \$ 649 Completed the ARIA Extended S-Band equipment installation and modification project. - (U) \$16,009 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$0 Not applicable. 										
Project 3620			Page 13 of 14 Pages				Exhibit R-2 (PE 0604759F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998																																																																	
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Project 3620	Page 14 of 14 Pages		Exhibit R-2 (PE 0604759F)																																																																		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605101F RAND Project Air Force	PROJECT 1110
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1110 Project Air Force	21,236	18,370	21,168	20,934	20,680	20,947	21,415	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

This program provides for continuing analytical research across a broad spectrum of aerospace issues and concerns. The Project AIR FORCE (PAF) research agenda is focused primarily on mid- to long-term problems; in addition, PAF provides quick response assistance for senior Air Force officials on high priority, near term issues. Results and analytical findings directly impact senior management deliberations on major issues. The Air Force Steering Group, chaired by the Vice Chief of Staff, reviews, monitors, and approves PAF annual research efforts. Each project is initiated, processed, and approved IAW PAF Sponsoring Agreement which requires General Officer (or SES equivalent) sponsorship and involvement on a continuing basis.

(U) PAF is organized in four primary research program areas. The principle focus of PAF research is the transition of the Air Force to the 21st Century: to provide for the projection of air and space power across the spectrum of conflict in an era of declining budgets, personnel and force structure. These programs address organizational cross-cutting issues encompassing the future security environment, strategy, doctrine, force development and force application, operational sustainment, applications of new technology, advances in modeling, simulation and analytical methods, resource management and system acquisition policies and processes.

(U) In FY 97, principal research efforts included studies on Chinese defense modernization and the USAF, air and space power in the service of national security in the 21st century, terrorism and counter-terrorism: implications for strategy and USAF planning, integrating USAF space operations, implications of unmanned air vehicles for the future shape of the Air Force, enhancing the effectiveness of air expeditionary forces, investment strategy for information operations, implementation of lean logistics, improved access to private sources of support, enhanced use of the commercial industrial base, and improved ways of measuring and forecasting air force readiness. Two major integrative efforts included assessing USAF roles in a joint context as support for USAF participation in the Quadrennial Defense Review (QDR) and analysis of the impact of specific force structure options considered by the Deep Attack Weapons Mix Study (DAWMS) on U.S. air superiority capability.

(U) During FY98 and FY99, research undertaken by Project AIR FORCE (PAF) will be driven by specific focus areas developed through the USAF long-range planning process, QDR / NDP (national defense panel) initiatives, and enduring areas of concern to USAF leadership. The research agenda is being designed to drive a specific 2-year, FY98/99, strategy. This 2-year strategy will establish major research activities in support of themes which focus on major external challenges and opportunities affecting USAF operations; institutionalization of the USAF vision and long range planning within doctrine, concepts and plans; integration of air and space operations; power projection forces; and, force mix and infrastructure.

(U) PAF research spans functional and organizational boundaries and is managed in a manner to facilitate independence and freedom from organizational bias providing perspectives and deliberative thought to senior Air Force leaders which may otherwise reflect parochial spins not necessarily in the best interest of the Air Force at large. As a result, the research conducted relates to a wide spectrum of Air Force activities and emerging issues.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605101F RAND Project Air Force	PROJECT 1110
<p>(U) Benefits of independent non-Department of Defense analysis of complex present day and emerging issues are enjoyed beyond the immediacy of the Air Force. PAF study results are given wide dissemination within the DOD on a routine basis and deposited with the Defense Technical Information Center available to a broad range of qualified government and commercial individuals and activities. This program is in budget activity 6 - Management and Support, because it funds RAND Project AIR FORCE (PAF), the only Air Force Federally Funded Research and Development Center for studies and analyses.</p> <p>(U) Acquisition Strategy: The RAND Project Air Force contract is a 5 year (base + 4 option yrs) Cost Plus / Award Fee contract</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,000 Strategy and Doctrine - (U) \$6,400 Force Employment and Modernization - (U) \$6,636 Resource Management and Systems Acquisition - (U) \$4,200 Integrative Research / Direct Support - (U) \$21,236 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,100 Strategy and Doctrine - (U) \$6,400 Force Employment and Modernization - (U) \$5,770 Resource Management and Systems Acquisition - (U) \$2,100 Integrative Research / Direct Support - (U) \$18,370 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$4,800 Strategy and Doctrine - (U) \$6,800 Force Employment and Modernization - (U) \$6,568 Resource Management and Systems Acquisition - (U) \$3,000 Integrative Research / Direct Support - (U) \$21,168 Total 		
Project 1110	<i>Page 2 of 3 Pages</i>	Exhibit R-2 (PE 0605101F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0605306F Ranch Hand II Epidemiology Study				PROJECT 2767	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2767 Ranch Hand II Epidemiology Study	8,827	10,285	4,408	4,527	4,570	11,592	11,175	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: This RDT&E Management Support program was directed in 1980 by the Assistant to the President of the United States for Domestic Affairs and Policy upon the recommendation of the Interagency Working Group on the Possible Long-Term Effects of Phenoxy Herbicides and Contaminants. As a result of this Presidential direction, PE 0605306F was established to conduct a 20-year epidemiology investigation of approximately 1,200 Air Force personnel who were involved with aerial spraying of herbicides in Vietnam from 1962 to 1971 (Operation Ranch Hand). The objective of this investigation is to determine whether long-term health effects exist and can be attributed to occupational exposure to phenoxy herbicides and their associated dioxins. Dioxin is an unwanted by-product from manufacturing Herbicide Orange.

This project involves a 20-year study that compares United States Air Force (USAF) Ranch Hand personnel to other USAF crew members and support personnel who were not exposed to herbicides while serving in Vietnam. Approximately 2,200 individuals (exposed personnel group plus control group) are participating in the study. Analyses of yearly mortality rates and the past and present health status of the study population were begun in 1982 with follow-up health examination schedules at the 3-, 5-, 10-, 15-, and 20-year time periods. The study includes examination of the possible occurrence of birth defects in children as determined from children's medical records and family medical histories.

(U) FY 1997 (\$ in Thousands):

- (U) \$6,196 Initiated fifth cycle of physical examinations, questionnaires, and participant data base; 1,078 examinations completed.
- (U) \$ 241 Conducted assays and data searches in support of ongoing epidemiologic study.
- (U) \$2,390 Processed and documented examination data.
 - (U) Began initial archiving of previous cycles' examination data and digitized the 1997 data as received.
 - (U) Conducted medical records coding and initiated verification of examination data base.
 - (U) Performed annual mortality analysis.
- (U) \$8,827 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0605306F Ranch Hand II Epidemiology Study	2767
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,732 Complete fifth cycle of physical examinations, questionnaires, and participant data base. - (U) \$ 376 Analyze laboratory specimens and conduct statistical research studies. <ul style="list-style-type: none"> - (U) Conduct serum dioxin assay. - (U) Analyze fat biopsies. - (U) Produce mathematical model to integrate mortality and morbidity data for analyses. - (U) \$2,177 Process and document examination data. <ul style="list-style-type: none"> - (U) Continue to verify physical examination data base. - (U) Accelerate archiving previous cycles' examination data and digitize the 1998 data as received. - (U) Conduct medical records coding. - (U) Perform annual mortality analysis. - (U) Conduct data analysis for journals and reports. - (U) \$10,285 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1,339 Complete examination data base and conduct statistical analyses of examination data. - (U) \$ 561 Analyze laboratory specimens and conduct statistical research studies. <ul style="list-style-type: none"> - (U) Conduct serum dioxin assays. - (U) Complete analyses of fat biopsies. - (U) Complete mathematical model to integrate mortality and morbidity data for analyses. - (U) \$2,508 Process and document examination data. <ul style="list-style-type: none"> - (U) Update participant data base. - (U) Continue archiving of examination data. - (U) Conduct medical records coding. - (U) Perform annual mortality analysis. - (U) Conduct data analysis for journals and reports. - (U) \$4,408 Total 		
Project 2767	Page 2 of 3 Pages	Exhibit R-2 (PE 0605306F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605306F Ranch Hand II Epidemiology Study	PROJECT 2767
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	
(U) Previous President's Budget (FY 1998 PB)	8,842	10,933	4,488		Cont
(U) Appropriated Value	9,212	10,933			
(U) Adjustments to Appropriated Value					
a. Congressional/General Reductions	-200	-451			
b. SBIR	-170	-197			
c. Omnibus/Other Above Threshold Reprogrammings					
d. Below Threshold Reprogrammings					
e. Rescissions	-15				
(U) Adjustments to Budget Year Since FY 1998 PB			-80		
(U) Current Budget Submit/FY 1999 PB	8,827	10,285	4,408		Cont

(U) Change Summary Explanation:

Funding: Funding levels vary due to timing of patient physical exams.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. Other Program Funding Summary: Not Applicable.

(U) D. Schedule Profile: Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605712F Initial Operational Test & Eval	PROJECT 0191
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0191 Initial Operational Test & Evaluation (IOT&E)	21,744	27,153	24,541	28,244	29,228	30,111	30,683	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification: IOT&E is an evaluation of a system's performance when the complete system is tested and evaluated against operational criteria by personnel with the same qualifications as those who will operate, maintain and support the system when deployed. In general, IOT&E is performed on new systems in development, major modifications and other systems as directed. This PE funds Congressionally mandated IOT&E to support major weapon system acquisition decisions (Milestone III). For major systems designated for use in combat, the law requires IOT&E be completed under realistic field conditions before proceeding beyond low rate initial production. As an essential element of IOT&E, this PE will fund major Operational Utility Evaluations (OUE), Early Operational Assessments (EOA) and Operational Assessments (OA) which support major milestones and decision points prior to Milestone III. IOT&E programs are identified in five categories: aircraft/support; space; missile/munitions; computer, communication, command and control and information (C4I); and general. This PE funds the costs of the test (e.g., data reduction, range costs, etc.), not the development of test resources or the maintenance of test infrastructure. Air Force Operational Test and Evaluation Center (AFOTEC) obtains general support services from contracts awarded after employing full and open competition contracting strategies. This program element is in Budget Activity 6, RDT&E Management Support, because it funds weapon system IOT&E tests conducted to evaluate a system's operational effectiveness and suitability and to identify any operational deficiencies or need for modifications in support of the acquisition process.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605712F Initial Operational Test & Eval	PROJECT 0191
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <p>– (U) \$ 5,998 <u>(U) Category: Aircraft/Support.</u> Conducted IOT&E on the F-22; Joint Strike Fighter (JSF); F- 15C/E TEWS; B-1 CMUP BLK D; B-1 CMUP BLK E; B-1B CMUP BLK F; CV-22; and other numerous systems.</p> <ul style="list-style-type: none"> - F-22: Developed and gained approval for the Operational Assessment Plan to support Low Rate Initial Production (LRIP). Conducted F-22 FMS Review. Developed modeling/simulation plan, F-15C Comparison Test Plan, Roll-up Methodology Model, and Integrated Data Processing Plan. - JSF: Developed and implemented initial AFOTEC Test Concept. Initiated the development of Critical Operational Issues (COIs), Measures of Effectiveness (MOEs), and Measures of Performance (MOPs) with US Navy, US Marine Corps, and Air Combat Command. - F-15 TEWS: The system provides self protection for F-15 aircraft. TEWS consists of four federated subsystems; the ALR-56 Radar Warning Receiver (RWR), the ALQ-135 Internal Countermeasures Set (ICS-a jammer), the ALQ-128 Electronic Warfare Warning Set (EWS), and the ALE-45 Countermeasures Dispenser (CMD). The ALR-56C provides threat warning for F-15C/E aircraft. The Band 3 provides countermeasures for F-15C/E aircraft. Neither the ALR-56C, Band 3, or Bank 1.5 have ever undergone an IOT&E. All of the ALR-56Cs and Band 3s have been produced. - B-1 CMUP Block D: Conducted Operational Assessment. - B-1 CMUP Blocks E/F: Conducted advance planning. - CV-22: Conducted Operational Assessment. <p>– (U) \$ 5,498 <u>(U) Category: Space.</u> Conducted IOT&E on CMU-CMU; ICBM Minuteman III GRP; MILSTAR; Evolved Expendable Launch Vehicle (EELV); Space Based Infrared System (High); Space Based Infrared System-LOW (SBIRS-LEO) and other numerous systems.</p> <ul style="list-style-type: none"> - CMU: Conducted Granite Shield and Air Mission Testing. - ICBM GRP: Conducted Operational Assessment and modeling/simulation. - MILSTAR: Complete Low Data Rate IOT&E and pre-test planning for MILSTAR II IOT&E - EELV: Conducted Operational Assessment, IOT&E Pre-test planning and Modeling/Simulation. - SBIRS (High): Conducted pre-test planning, modeling/simulation, validation verification & accreditation (VV&A) effectiveness model, ground and space segment survivability analysis, and manning, workload and performance assessment. - SBIRS (Low): Conducted OT&E program readiness assessment, monitoring design and test activities, infrared sensor stimulation/risk reduction analysis (IRSS), hardware/software integration for flight test demo, hardbody radiation analysis, and pre-test planning. 		
Project 0191	Page 2 of 7 Pages	Exhibit R-2 (PE 0605712F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605712F Initial Operational Test & Eval PROJECT 0191	
<p>– (U) \$ 2,452</p> <p>– (U) \$ 3,203</p> <p>– (U) \$ 4,593</p> <p>– (U) \$21,744</p>	<p>(U) <u>Category: Missile/Munitions.</u> - Conducted IOT&E on Joint Direct Attack Munitions (JDAM); Joint Standoff Weapon (JSOW); AIM-9X Air-to-Air (AIM-9X); and Joint Air-to Surface Stand-OFF Missile (JASSM). - JDAM: Conducted test planning, operational assessment and IOT&E contractor support, target build-up, and range support. - JSOW: Conducted test planning, test execution, contractor support, and range support. - AIM-9X: Conducted Modeling/Simulation. - JASSM: Oct 96 - Mar 97. Completed Evaluation Concept and started OT&E Test Plan including: test design matrix, refinement of test scenarios, development of JASSM survivability, damage and reliability methodology. Outlined preliminary Data Management Analysis Plan (DMAP).</p> <p>(U) <u>Category: Computer, Communication, Command and Control and Information System (C4 I).</u> Conducted IOT&E on JTIDS Class 2 Terminal Multiservice (JTIDS CL2). - JTIDS Class 2 Terminal: Conducted Multi-service IOT&E and range support.</p> <p>(U) <u>Category: General.</u> Conducted IOT&E on Wind Corrected Munitions Dispenser (WCMD) and Chemical Hardened Air Transportable Hospital (CHATH) and other numerous systems. - WCMD: System is a new tail kit designed to correct for launch transients, ballistic error from lofts, medium-and high altitude deliveries, and unknown winds between release point and function altitude for CBU (CEM/Gator/SFW) munitions. The combined DT/IOT&E supports an initial LRIP decision in Nov 97, a B-52 required assets available (RAA) data in Feb 97 and Milestone III in FY99. - CHATH: Program is a modification to the currently-fielded Air Transportable Hospital (ATH). The additional configuration includes currently-fielded M-28 chemical liners and airlocks, and the developed chemically hardened air management plan (CHAMP), a four-to-one replacement for the ECU. The CHAMP provides the over-pressurization and filtered air needed to chemically harden the ATH. DT&E completed in Dec 96, system certification in Feb. 97, IOT&E testing 3 Mar - 7 Apr 97, and Milestone III decision in May 97.</p> <p>Total</p>	
Project 0191	Page 3 of 7 Pages	Exhibit R-2 (PE 0605712F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605712F Initial Operational Test & Eval	
PROJECT 0191		
(U) FY 1998 (\$ in Thousands):		
<p>– (U) \$ 9,743</p>	<p><u>(U) Category: Aircraft/Support.</u> Conduct IOT&E on the F-22; Joint Strike Fighter (JSF); F-15 TEWS; B-1 CMUP BLK D; B-1 CMUP BLK E; B-1B CMUP BLK F; CV-22 and other numerous systems.</p> <ul style="list-style-type: none"> - F-22: Implement Operational Assessment plan and reporting results to LRIP. Finalize Roll-up Methodology Model and F-15C Comparison Test Plan and coordinate required range and aircraft requirements. - JSF: Develop, coordinate with USN/USMC, and gain approval of Early Operational Assessment Plan. Prepare resource requirement plan and initiate resource acquisition. - F-15 TEWS: Conduct suitability assessment, and type 1 training - B-1B CMUP Block D: Conduct IOT&E testing. - B-1B CMUP Block E: Conduct advance planning, contractor support modeling simulation - B-1B CMUP Block F: Conduct advance planning, contractor support, fuze model development, Joint Modeling and Simulation System (JMASS), and end game interface work. - CV-22: Conduct operational test. 	
<p>– (U) \$ 5,745</p>	<p><u>(U) Category: Space.</u> Conduct IOT&E on CMU-CMU; ICBM-Minuteman III Guidance Program (ICBM-MMIII GRP); MILSTAR; Evolved Expendable Launch Vehicle (EELV); Space Based Infrared System-High; Space Based Infrared System-LOW (SBIRS-LEO) and other numerous systems.</p> <ul style="list-style-type: none"> - CMU: Finish air mission testing, and Cheyenne Mountain testing. - ICBM GRP: Modeling/Simulation, range support, and guidance replacement testing. - MILSTAR: Participate in combined DT/OT. - EELV: Conduct Operational Assessment, IOT&E pre-test planning, modeling/simulation - SBIRS (HIGH): Modeling/simulation, Validation Verification and Accreditation (VV&A) Effectiveness models, ground and space segment survivability analysis, operational assessment of ground consolidation, hardware/software integration, and planning for FY99 IOT&E. - SBIRS (LOW): OT&E Program Readiness Assessment, Modeling and Simulation, Test and Evaluation Planning; and pre-test planning. 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE PROJECT	
6 - Management and Support	0605712F Initial Operational Test & Eval 0191	
<p>– (U) \$ 3,228</p> <p>– (U) \$ 2,939</p> <p>– (U) \$ 5,498</p> <p>– (U) \$27,153</p>	<p><u>(U) Category: Missile/Munitions.</u> Conduct IOT&E on Joint Direct Attack Munitions (JDAM); Joint Standoff Weapon (JSOW); AIM-9X Air-to-Air (AIM-9X); and Joint Air-to Surface Stand-OFF Missile (JASSM). - JDAM: Conduct IOT&E testing, contractor support, and range support - JSOW: IOT&E testing, phase II test planning and contract support - AIM-9X: Data Reduction, DMAP production and modeling/simulation - JASSM: Oct 97 - Jan 98 - Complete OT&E Test Plan; develop and provide program introduction document to test ranges; complete and brief Milestone II operational assessment; finalize CDT/OT plan with JPO and contractors, range costs including simulator initial checkout and possible simulator deployments.</p> <p><u>(U) Category: Computer, Communication, Command and Control and Information System (C4I).</u> Conduct IOT&E on Region/Sector Air Operations Center (R/SAOC); and Joint Precision Approach and Landing System (JPALS) and other numerous systems. - R/SAOC (formerly R/SOCC): Concept development and test plan developments. - JPALS: Conducting Operational Test, contractor support, data analysis, data reduction, and range support.</p> <p><u>(U) Category: General.</u> Conduct IOT&E on Wind Corrected Munitions Dispenser (WCMD) and other numerous systems. - WCMD: IOT&E test continues at Eglin AFB FL, and Utah Test and Training Range. Dedicated IOT&E will employ inert munitions to evaluate multiple-wean deliveries and to measure CEP to an 80% confidence level.</p> <p>Total</p>	
(U) <u>FY 1999 (\$ in Thousands):</u>		
<p>– (U) \$ 8,720</p>	<p><u>(U) Category: Aircraft/Support.</u> Conduct IOT&E on the F-22; Joint Strike Fighter (JSF); F-15C/E TEWS; B-1 CMUP BLK E; B-1B CMUP BLK F; CV-22 and other numerous systems. - F-22 : Conduct F-15C Comparison Test open-air Testing; Conduct Operational Assessment to Support Certification Ready for IOT&E. - JSF: Conduct Early Operation Assessment. - F-15 TEWS: Conduct IOT&E testing. - B-1B CMUP Block E: Advance planning, contractor support, and modeling/simulation. - B-1B CMUP Block F: Advance Planning, contractor support, and fuze model development. - CV-22: Contractor support for operational evaluation (OPEVAL)</p>	
Project 0191	Page 5 of 7 Pages	Exhibit R-2 (PE 0605712F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE PROJECT	
6 - Management and Support	0605712F Initial Operational Test & Eval 0191	
– (U) \$ 5,185	(U) <u>Category: Space.</u> Conduct IOT&E on CMU-CMU; MILSTAR; Evolved Expendable Launch Vehicle (EELV) and other numerous systems.	
	<ul style="list-style-type: none"> - CMU: Complete Cheyenne Mountain Testing. - MILSTAR: Participate in combined DT/OT. - EELV: Conduct Operational Assessment #2. 	
– (U) \$ 2,961	(U) <u>Category: Missile/Munitions.</u> Conduct IOT&E for Joint Standoff Weapon (JSOW); AIM-9X Air-to-Air (AIM-9X); and Joint Air-to-Surface Stand-OFF Missile (JASSM).	
	<ul style="list-style-type: none"> - JSOW: Conduct IOT&E testing, phase II testing planning, and contractor support. - AIM-9X: Conduct data reduction, DMAP Production, and modeling/simulation. - JASSM: Participate and accomplish CDT/OT; prepare for IOT&E (planned start Feb). Provide manpower and equipment, and range cost including possible simulator deployment and early CDT/OT testing. 	
– (U) \$ 2,705	(U) <u>Category: Computer, Communication, Command and Control and Information System (C4I).</u> Conduct IOT&E on Region/Sector Air Operation Center (R/SACC) and other numerous systems.	
	<ul style="list-style-type: none"> - R/SAOC (formerly R/SOCC): Conduct IOT&E testing 	
– (U) \$ 4,970	(U) <u>Category: General.</u> Conduct IOT&E Casualty Care Systems; Base Intrusion Security Systems (BISS); Chemical Warfare Defense, Next Generation Generators and External Control Unit and other numerous systems.	
	<ul style="list-style-type: none"> - CCS: Test all newly developed flyaway transportable medical care systems. - BISS: Conduct on-going tests of various commercial off-the-shelf and other personnel and asset protection techniques. - CWD: AF focus of chemical protection programs. - Next Generation Generator and External Control Units: Support the Airbase Operability Concept. 	
– (U) \$24,541	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605712F Initial Operational Test & Eval	PROJECT 0191		
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	21,454	28,319	25,035	Cont
(U) Appropriated Value	21,921	28,319		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-467	-1,166		
b. SBIR				
c. Omnibus or Other Above Threshold Reprogramming				
d. Below Threshold Reprogramming	290			
e. Rescissions				
(U) Adjustment to Budget Years Since FY 1998 PB			-494	
(U) Current Budget Submit/FY 1999 President's Budget	21,744	27,153	24,541	Cont
(U) Change Summary Explanation:				
Funding: FY97 general reductions of \$467 thousand and below threshold reprogramming of \$290 thousand for Precision Landing System Receiver. FY98 general reductions of \$1,166 thousand. FY99 adjustment of \$494 thousand due to revised inflation indices.				
Schedule: None.				
Technical: None.				
(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> Not applicable.				
(U) D. <u>Schedule Profile:</u> IOT&E is not an acquisition program. There are dozens of IOT&E programs in any one fiscal year. The AFOTEC automated test resource plan database does not provide quarterly IOT&E test schedules. However, specific IOT&E schedules can be made available on a case-by-case basis through the appropriate AFOTEC test resource management office.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	413,892	372,496	370,168	393,523	375,245	389,363	406,804	Continuing	TBD
06TS Test and Evaluation Support (1,4)	307,564	351,502	348,933	370,339	353,860	365,017	382,042	Continuing	TBD
06TG 46 Test Group	19,828	20,994	21,235	23,184	21,385	24,346	24,762	Continuing	TBD
06AS Aircraft Support (2)	11,431	0	0	0	0	0	0	0	TBD
06MC Minor Construction (3,4)	3,500	0	0	0	0	0	0	0	TBD
06MR Maintenance and Repair (3,4)	71,569	0	0	0	0	0	0	0	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

- (1) Beginning in FY98, all test support mission requirements and their associated funding are consolidated in projects 06TS and 06TG of PE 0605807F. All test support aircraft requirements and funding were realigned to 06TS for FY98-03 (formerly in project 06AS for FYs 96 and 97). Also consolidated in project 06TS starting in FY98 are the test facility maintenance, repair and minor construction requirements formerly funded in projects 06MR and 06MC. Those two projects captured both test and non-test requirements in FYs 96 and 97. In FY98, the non-test maintenance and repair and minor construction requirements (i.e., in support of non-test general installation infrastructure such as dormitories, general purpose buildings) were transferred to PE 0605878F (Maintenance and Repair) and PE 0605876F (Minor Construction), respectively, thus carving out the non-test requirements and placing them in PEs whose nomenclature mirrors the rest of the Air Force's base support functions.
- (2) Aircraft Support requirements and funding moved to Test and Evaluation Support, project 06TS, for FYs 98-03.
- (3) In FY98, funding for Minor Construction, 06MC was transferred to PE 0605876F, and funding for Maintenance and Repair, project 06MR was transferred to PE 0605878F. The total program content and funding transfer from PE 0605807F to these PE's was approximately 75% through FY98-03. The remaining 25% was transferred to project 06TS for specific test mission support requirements.
- (4) In FY99 and outyears, the non-test maintenance and repair and minor construction requirements were transferred from RDT&E to O&M (PEs 0702878F, AFMC Maintenance and Repair; and PE 0702876F, Minor Construction) to support DoD's policy revision to fund base operating non-test functions in the O&M appropriation. This FY99 and outyear transfer did not affect this program element's content or funding because of the reasons stated above in notes (1) and (3).

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt																																																								
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> Test facilities, capabilities and resources operated through this program include wind tunnels, rocket and jet engine test cells, limited space environmental simulation chambers, armament test ranges, climatic test facilities, avionics test facilities, aircraft testbeds, dry lakebed landing sites, instrumented test ranges, maintenance and repair of test facilities, civilian payroll, and contractor services. It also provides resources for maintaining Air Force Materiel Command (AFMC) assigned test and test support coded aircraft. No acquisition contracts are funded from this program; test support contracts for services and supplies and equipment are predominately awarded on the basis of full and open competition. This program element is in Budget Activity 6, RDT&E Management Support, because it funds infrastructure resources (civilians, aircraft, facilities and ranges) to operate the Air Force test activities which are included in the Department of Defense (DoD) Major Range and Test Facility Base (MRTFB).</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;"></th> <th style="text-align: right;"><u>FY 1997</u></th> <th style="text-align: right;"><u>FY 1998</u></th> <th style="text-align: right;"><u>FY 1999</u></th> <th style="text-align: right;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">414,901</td> <td style="text-align: right;">389,348</td> <td style="text-align: right;">389,527</td> <td style="text-align: right;">Cont</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">425,195</td> <td style="text-align: right;">387,848</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional/General Reductions</td> <td style="text-align: right;">-8,998</td> <td style="text-align: right;">-15,352</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: right;">-1,689</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: right;">-616</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-19,359</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">413,892</td> <td style="text-align: right;">372,496</td> <td style="text-align: right;">370,168</td> <td style="text-align: right;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: FY97 below threshold reprogramming of \$1,689 thousand for Base Operations Support requirements at Eglin, Edwards and Arnold AFBs. FY98 changes are due to general reductions. FY99 budget reduction reflects a revised test infrastructure maintenance, repair and base support program in order to meet only the most critical and urgent requirements needed to sustain FY99 operations.</p> <p>Schedule: None.</p> <p>Technical: None.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	414,901	389,348	389,527	Cont	(U) Appropriated Value	425,195	387,848			(U) Adjustments to Appropriated Value					a. Congressional/General Reductions	-8,998	-15,352			b. SBIR					c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	-1,689				e. Rescissions	-616				(U) Adjustments to Budget Years Since FY 1998 PB			-19,359		(U) Current Budget Submit/FY 1999 President's Budget	413,892	372,496	370,168	Cont
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<i>Page 2 of 19 Pages</i>		<i>Exhibit R-2 (PE 0605807F)</i>																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	
6 - Management and Support	0605807F Test And Evaluation Spt	
<p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>: Not applicable.</p> <p>Related RDT&E: (U) PE 0604759F, Major T&E Investment (Technical capability improvement and modernization) (U) PE 0604256F, Threat Simulator Development (U) PE 0604940D, Central Test & Evaluation Improvement Program (T&E investments for new tri-service test capabilities)</p> <p>(U) D. <u>Schedule Profile</u>: Most all T&E support requirements are continuous and are not driven by discrete start/end dates.</p>		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt	PROJECT 06TS
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
06TS Test and Evaluation Support (1,4)	307,564	351,502	348,933	370,339	353,860	365,017	382,042	Continuing	TBD

(1) FY98 requirements and funding increased for Test and Evaluation Support, project 06TS, to reflect a transfer of test mission maintenance and repair and minor construction requirements formerly identified in projects 06MR and 06MC, respectively. Likewise, all content in PE 0605896F (RDT&E Base Operations Support) that was more accurately identified as test support has been transferred to this project effective starting in FY98. In addition, all aircraft support requirements and funding (FYs 98-03) are now reflected in this project for FY98-03 (formerly in project 06AS). The cumulative effect of these changes carves out test from non-test, aligns test vs non-test requirements in their appropriate PEs, and shows a more accurate accounting for both test support and base support functions.

(U) A. Mission Description and Budget Item Justification: This project provides resources to operate the Air Force test activities which are included in the Department of Defense (DoD) Major Range and Test Facility Base (MRTFB). Test facilities/capabilities operated through this program include wind tunnels, rocket and jet engine test cells, limited space environmental simulation chambers, armament test ranges, climatic test facilities, avionics test facilities, aircraft testbeds, dry lakebed landing sites, instrumented test ranges, and test aircraft maintenance. T&E Support funds test infrastructure overhead activities including: Command and supervisory staffs; supply stocks; maintenance, repair, and replacement of worn or obsolete test equipment and facilities; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries; temporary duty travel; support contract costs for hardware and software engineering and maintenance; and minor improvement and modernization projects. It also funds overhead test aircraft depot level maintenance such as: Programmed Depot Maintenance (PDM), the calendar-based cyclic scheduling of aircraft into depots for update/inspection; modifications and any other depot level repairs required by the aircraft System Program Directors (SPD); engine overhauls; depot-provided area assistance; and assorted ground support equipment overhauls. Three major Air Force test centers are supported by this project: (1) Arnold Engineering and Development Center (AEDC), located at Arnold Air Force Base, TN, whose test infrastructure overhead supports operations for the largest complex of ground test facilities in the free world (includes transonic, supersonic, and hypersonic wind tunnels; rocket motor and turbine engine test cells; space environmental test chambers, hyperballistic ranges; and other specialized facilities). (2) Air Force Flight Test Center (AFFTC), located at Edwards AFB, CA, whose test infrastructure overhead supports weapons system development and operational test and evaluation for aircraft, aircraft subsystems and aircraft weapon systems, aerospace research vehicles, unmanned miniature vehicles, cruise missiles, parachute delivery/recovery systems, cargo handling systems, and Electronic Warfare (EW) systems for DoD and allied forces. The AFFTC mission includes the USAF Test Pilot School. (3) Air Force Development Test Center (AFDTC), located at Eglin AFB, FL, whose test infrastructure overhead supports development testing of non-nuclear air armaments (including aircraft guns, ammunition, bombs, and missiles). AFDTC provides a scientific test process that supports the development and enhancement of munitions systems. T&E support services contracts are severable and are awarded on the basis of full and open competition.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt	
(U) <u>FY 1997 (\$ in Thousands):</u>		
Arnold Engineering and Development Center		
– (U) \$ 111,625	Provided test infrastructure overhead support to enable ground testing for classified programs, and unclassified programs (F-22, Joint Direct Attack Munition (JDAM), F-15, F-16, Joint Strike Fighter (JSF), B-1B, B-2, C-130, Advanced Medium Range Air to Air Missile (AMRAAM), AIM 9X, Minuteman, Evolutionary Expendable Launch Vehicle (EELV), Titan IV and F-18).	
Aircraft Modification Directorate		
– (U) \$ 2,000	Funded indirect labor and supporting expenses (training, travel, office supplies, etc.) and support services required for the aircraft modification mission.	
Air Force Flight Test Center		
– (U) \$ 96,250	Provided test infrastructure overhead support enabling testing of the B-1B, B-2, F-16, F-15, F-15E, F-22, Advanced Fighter Technology Integration (AFTI)/F-16, C-17, Avionics Test and Integration Complex (ATIC), Advanced Range Instrumentation Aircraft (ARIA), Electronic Combat Countermeasures (ECCM), Electronic Warfare (EW) (B-1B ALQ-161, F-16 AN/ASQ-213, C-130 ALQ-172, etc.), and classified programs.	
– (U) \$ 18,600	USAF Test Pilot School operating costs.	
Air Force Development Test Center		
– (U) \$ 68,239	Provided test infrastructure support for non-nuclear air armaments (AMRAAM, SEEK EAGLE, Theater Missile Defense (TMD), JDAM, Joint Stand-Off Weapon (JSOW), Wind Corrected Munitions Dispenser (WCMD), Joint Air to Surface Standoff Missile (JASSM) etc.); Command, Control, Communications, Computers and Information (C4I) / Command and Control Consolidated Test Force (C2CTF) (Joint Targeting Information Display System (JTIDS), Base and Installation Security System (BISS), TMD, Theater Battle Management Core System (TBMCS), and aircraft software upgrades (Air Force Mission Support System (AFMSS).	
Service Requirements		
– (U) \$9,900	DFAS financial reporting services payment	
– (U) \$ 450	Federal Workforce Restructuring Act (FWRA) payment	
– (U) \$ 500	Vision 21 Support	
– (U) \$307,564	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
Arnold Engineering and Development Center		
– (U) \$110,209	Continue test infrastructure overhead support to enable ground testing for classified programs, and unclassified programs (F-22, JDAM, F-15, F-16, JSF, B-1B, B-2, C-130, AMRAAM, AIM 9X, Minuteman, EELV, Titan IV and F-18). Begin test infrastructure overhead support for Tunnel 9 that was transferred from the Navy to the USAF effective 1 Oct 97.	
– (U) \$ 13,331	T&E specific Base Operating Support (BOS) requirements	
– (U) \$ 15,922	Maintenance, repair and minor construction for test infrastructure requirements.	
Project 06TS	Page 5 of 19 Pages	Exhibit R-2 (PE 0605807F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0605807F Test And Evaluation Spt	06TS
<ul style="list-style-type: none"> - (U) \$ 15 Federal Workforce Restructuring Act (FWRA) payment Air Force Flight Test Center - (U) \$ 99,078 Continue to provide test infrastructure overhead support enabling testing of the B-1B, B-2, F-16, F-15, F-15E, F-22, AFTI/F-16, C-17, ATIC, ARIA, ECCM, EW (B-1B ALQ-161, F-16 AN/ASQ-213, C-130 ALQ-172, etc.), and classified programs. - (U) \$ 18,900 USAF Test Pilot School operating costs. - (U) \$ 3,464 T&E specific BOS requirements - (U) \$ 10,541 Programmed Depot Maintenance and engine overhauls for aircraft assigned to AFFTC. - (U) \$ 1,460 Maintenance, repair and minor construction for test infrastructure requirements. - (U) \$ 148 Federal Workforce Restructuring Act (FWRA) payment Air Force Development Test Center - (U) \$ 66,775 Continue test infrastructure overhead support for non-nuclear air armaments (AMRAAM, SEEK EAGLE, TMD, JDAM, JSOW, WCMD, etc.); C4I (JTIDS, BISS, TMD), and aircraft software upgrades. - (U) \$ 6,901 T&E specific BOS requirements - (U) \$ 3,220 Programmed Depot Maintenance and engine overhauls for aircraft assigned to AFDTC. - (U) \$ 1,430 Maintenance, repair and minor construction for test infrastructure requirements. - (U) \$ 108 Federal Workforce Restructuring Act (FWRA) payment - (U) \$351,502 Total 		
(U) <u>FY 1999 (\$ in Thousands):</u>		
Arnold Engineering and Development Center		
<ul style="list-style-type: none"> - (U) \$111,080 Continue test infrastructure overhead support to enable ground testing for classified programs, and unclassified programs (F-22, JDAM, F-15, F-16, JSF, B-1B, B-2, C-130, AMRAAM, AIM 9X, Minuteman, EELV, Titan IV and F-18). Continue Tunnel 9 infrastructure support. - (U) \$ 13,436 T&E specific BOS requirements - (U) \$ 16,376 Maintenance, repair and minor construction for test infrastructure requirements. Air Force Flight Test Center - (U) \$ 99,264 Continue to provide test infrastructure overhead support enabling testing of the B-1B, B-2, F-16, F-15, F-15E, F-22, AFTI/F-16, C-17, ATIC, ARIA, ECCM, EW (B-1B ALQ-161, F-16 AN/ASQ-213, C-130 ALQ-172, etc.) - (U) \$ 19,200 USAF Test Pilot School operating costs. - (U) \$ 11,456 Programmed Depot Maintenance and engine overhauls for aircraft assigned to AFFTC. - (U) \$ 3,569 T&E specific BOS requirements - (U) \$ 1,760 Maintenance, repair and minor construction for test infrastructure requirements. 		
Project 06TS	Page 6 of 19 Pages	Exhibit R-2 (PE 0605807F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0605807F Test And Evaluation Spt	06TS
Air Force Development Test Center		
- (U) \$ 60,572	Continue test infrastructure support for non-nuclear air armaments (AMRAAM, SEEK EAGLE, TMD, JDAM, JSOW, WCMD, JASSM etc.); C4I/C2CTF (JTIDS, BISS, TMD,TBMCS), and aircraft software upgrades (AFMSS).	
- (U) \$ 2,632	Programmed Depot Maintenance and engine overhauls for aircraft assigned to AFDTC.	
- (U) \$ 7,778	T&E specific BOS requirements	
- (U) \$ 1,810	Maintenance, repair and minor construction for test infrastructure requirements.	
- (U) \$348,933	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0605807F Test And Evaluation Spt	06TS
<p>AFDTC: Reductions to Management Support funding resulted in: 1) the elimination of AFDTC two test support helicopters resulting in the loss of a low velocity sensor test bed, the loss of capability to support programs in remote parts of the Eglin Range, and elimination of instantaneous support for emergency situations on Eglin Range; 2) reduction of T&E munitions support to Foreign Military technology evaluation programs will result in delays to and decreases in the level of support to joint AF-Foreign Military munitions development programs and foreign technology evaluation programs; 3) deferment of the replacement of computer workstations supporting test programs and AFDTC support operations . Funding to support DLRs, PMEL, and Transient Alert will continue to be decreased. Only the most critical T&E BOS and MR/MC requirements continue to be funded. Several facility projects including the installation of a fire detection system, the repair of Foreign Object Damage (FOD) prevention grates around AFDTC hangars, the repair of hangar doors and weather sealing, and repair of water damaged offices (due to leaking roofs) will be postponed. Unfunded requirements are deferred to FY00 and out.</p> <p>Schedule: None.</p> <p>Technical: None.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> Not applicable.</p> <p>Related RDT&E: (U) PE 0604759F, Major T&E Investment (Technical capability improvement and modernization) (U) PE 0604256F, Threat Simulator Development (U) PE 0604940D, Central Test & Evaluation Improvement Program (T&E investments for new tri-service test capabilities)</p> <p>(U) D. <u>Schedule Profile:</u> Most T&E test infrastructure overhead requirements are continuous and are not driven by discrete start/end dates.</p>		
Project 06TS	Page 9 of 19 Pages	Exhibit R-2 (PE 0605807F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0605807F Test And Evaluation Spt				PROJECT 06TG		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
06TG 46 Test Group	19,828	20,994	21,235	23,184	21,385	24,346	24,762	Continuing	TBD	
<p>(U) A. <u>Mission Description and Budget Item Justification:</u> This project funds test infrastructure overhead support including: Command and supervisory staffs; supply stocks; upkeep, refurbishment, repair, and replacement of non-repairable or obsolete test equipment; test infrastructure for data collection, transmission, reduction, and analysis; civilian salaries, utilities, temporary duty travel, support contract costs for hardware and software engineering and maintenance. Project infrastructure support is provided for the unique capabilities of the 46th Test Group facilities: Central Inertial Guidance Test Facility (CIGTF), the High Speed Test Track (HSTT), and the Radar Target Scatter (RATSCAT) facility. CIGTF provides independent assessments of inertial components, aircraft navigation systems, and missile guidance systems. HSTT capabilities include full-scale testing in flight environments, realistic live-fire simulations, test item and target fragment recovery, and precision trajectory analysis and high speed photography. RATSCAT provides radar cross section (RCS) monostatic and bi-static amplitude and phase measurements, antenna pattern measurements, glint and near field measurements for low observable targets. The 46th TG support services contracts are severable and are awarded on the basis of full and open competition.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,598 Central Inertial Guidance Test Facility (CIGTF): FY97 supported test programs such as Advanced Inertial Concepts (AICON), continued Global Positioning System-Joint Program Office (GPS-JPO) Responsible Test Organization RTO responsibilities, Project 2000 integration support, GPS jamming and electronic countermeasures, NAVWAR, Federal Aviation Administration (FAA) Wide Area Augmentation System, GPS integrated and embedded INS programs, aircraft navigation systems, including B-2 and F-22, munitions navigation systems such as JDAM and other programs. - (U) \$4,845 Holloman High Speed Test Track (HHSTT): Provided infrastructure test support (including full-scale testing simulating in-flight environments, realistic live-fire simulations, test item and target fragment recovery, precision trajectory analysis, and high speed photography) for the F-22A Ejection System, 4th Generation Ejection Seat, Standard Missile (SM) 2 Seeker, SM 2 Live Fire T&E (LFT&E), Patriot Advanced Capability (PAC) 3 LFT&E, Theater High Altitude Area Defense (THAAD) LFT&E, Special Operation Forces (SOF) Directed Infrared Countermeasures (DIRCM), Advanced Inertial Concepts (AICON) missile navigation system, and other programs. - (U) \$4,214 Radar Target Scatter (RATSCAT) facility: Provided infrastructure test support for programs such as static RCS testing for stores, low observable testbeds, and other classified programs. - (U) \$7,171 46th Test Group Headquarters (46TG). Provided command guidance, resource management, plans and programs, protection services, information systems, logistics, liaison support and scheduling for WSMR airspace, photo and safety chase, support of air-to-air and air-to-ground live fire, life support equipment services, and aerospace ground equipment support. - (U) \$19,828 Total 										
Project 06TG			Page 10 of 19 Pages				Exhibit R-2 (PE 0605807F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0605807F Test And Evaluation Spt	06TG
<u>(U) FY 1998 (\$ in Thousands):</u>		
– (U) \$4,411	Central Inertial Guidance Test Facility (CIGTF): Provide infrastructure test support for programs such as AICON, continued GPS-JPO RTO responsibilities, Project 2000 integration support, GPS jamming and electronic countermeasures, NAVWAR, FAA Wide Area Augmentation System, GPS integrated and embedded INS programs, aircraft navigation systems, including B-2 and F-22, munitions navigation systems such as JDAM and other programs.	
– (U) \$5,562	Holloman High Speed Test Track (HSTT) : Provide infrastructure test support for the F-22A Ejection System, Russian K-36 Derivative Ejection Seat, Standard Missile (SM) 2 Seeker, SM 2 Forward Looking Fuze, SM-2 Live Fire T&E (LFT&E), Patriot Advanced Capability (PAC) 3 LFT&E, Theater High Altitude Area Defense (THAAD) LFT&E, Army Tactical Infrared Countermeasure System (ATIRCMS) Phase II, Long-Range Fiber Optic Guided (LONGFOG) missile, and other programs.	
– (U) \$5,392	Radar Target Scatter (RATSCAT) facility: Provide infrastructure test support for programs such as static RCS testing for stores, low observable testbeds, and other classified programs.	
– (U) \$5,629	46th Test Group Headquarters (46TG). Provide command guidance, resource management, plans and programs, protection services, information systems, logistics, liaison support and scheduling for WSMR airspace, photo and safety chase, support of air-to-air and air-to-ground live fire, life support equipment services, and aerospace ground equipment support.	
– (U) \$20,994	Total	
<u>(U) FY 1999 (\$ in Thousands):</u>		
– (U) \$4,592	Central Inertial Guidance Test Facility (CIGTF): Provide infrastructure test support for programs such as AICON, continued GPS-JPO RTO responsibilities, Project 2000 integration support, GPS jamming and electronic countermeasures, NAVWAR, FAA Wide Area Augmentation System, GPS integrated and embedded INS programs, aircraft navigation systems, including B-2 and F-22, munitions navigation systems such as JDAM and other programs.	
– (U) \$5,790	Holloman High Speed Test Track (HHSTT): Provide infrastructure test support (including full-scale testing simulating in-flight environments, realistic live-fire simulations, test item and target fragment recovery, and precision trajectory analysis and high speed photography) for the F-22A Ejection System, Advanced Concepts Escape system (ACES) II continuous Improvement Program (CIP), Standard Missile (SM) 2 Seeker, SM 2 LFT&E, SM 3 LFT&E, Patriot Advanced Capability (PAC) 3 Live Fire T&E (LFT&E), Theater High Altitude Area Defense (THAAD) LFT&E, and other programs.	
– (U) \$5,613	Radar Target Scatter (RATSCAT) facility: Provide infrastructure test support for programs such as static RCS testing for stores, low observable testbeds, and other classified programs.	
– (U) \$5,240	46th Test Group Headquarters (46TG). Provide command guidance, resource management, plans and programs, protection services, information systems, logistics, liaison support and scheduling for WSMR airspace, photo and safety chase, support of air-to-air and air-to-ground live fire, life support equipment services, and aerospace ground equipment support.	
– (U) \$21,235	Total	
Project 06TG	Page 11 of 19 Pages	Exhibit R-2 (PE 0605807F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt			PROJECT 06TG
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	20,154	22,173	23,269	Cont
(U) Appropriated Value	21,094	21,803		
(U) Adjustments to Appropriated Value				
a. Congressional Reductions	-1,151	-809		
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-84			
e. Rescissions	-31			
(U) Adjustments to Budget Years Since FY 1998 PB			-2,034	
(U) Current Budget Submit/FY 1999 President's Budget	19,828	20,994	21,235	Cont
(U) Change Summary Explanation:				
Funding FY97: Below threshold reprogramming of \$84 thousand for Base Operations Support requirements at Eglin, Edwards and Arnold AFBs.				
Funding FY98: Funding cuts push improvement of aging T&E equipment and facilities to FY99 and out. This increases the length of a standard test program. The level and quality of test products also suffer. Specifically 46 Test Group has delayed the upgrade of its Time Space Position Information (TSPI) system. Under the new Federal Communication Commission (FCC) spectrum reallocation regulations, the range of the existing TSPI system is limited, severely impacting navigation and Global Positioning System (GPS) testing. Replacement of HHSTT video test recording system has been delayed. This new digital recording system would increase the amount of data collected while decreasing costs. The GPS Modeling and Simulation laboratory has delayed the upgrade of its VAX computer workstations. Currently the capabilities of the lab are limited by the software available for the VAX computers.				
Funding FY99: Funding cuts in FY99 will impact several upgrade projects to 46TG's aging test infrastructure. The RATSCAT Advance Measurement System will have to defer the modernization of its special access required (SAR) data room. Currently there is only one SAR data room. This greatly limits the number of SAR programs that can be accomplished. The addition of an additional SAR data room would increase the number of tests that can be simultaneously accomplished. The HHSTT currently has one aging Multi-Axis Seat Ejection (MASE) Sled. This sled supports the F-22 ejection seat program and the 4th Generation Ejection Seat Program. This is the only sled of its kind and is a single-point failure for numerous DoD programs. The addition of a second MASE sled will be postponed.				
Schedule: None.				
Technical: None.				
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt	February 1998
PROJECT 06TG		
<p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>: Not applicable.</p> <p>Related RDT&E: (U) PE 0604759F, Major T&E Investment (Technical capability improvement and modernization) (U) PE 0604256F, Threat Simulator Development (U) PE 0604940D, Central Test & Evaluation Improvement Program (T&E investments for new tri-service test capabilities)</p> <p>(U) D. <u>Schedule Profile</u>: 46TG infrastructure support operations are continuous and are not driven by discrete start/end dates.</p>		
Project 06TG	Page 13 of 19 Pages	Exhibit R-2 (PE 0605807F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt	PROJECT 06AS
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
06AS Aircraft Support (2)	11,431	0	0	0	0	0	0	0	TBD

(U) **A. Mission Description and Budget Item Justification:** The RDT&E aircraft support program provides resources for maintaining Air Force Materiel Command (AFMC) assigned test and test support coded aircraft whose flying missions support the Department of Defense Major Range and Test Facility Base (MRTFB). This program supports a multitude of mission designs and configurations, with many prototype, preproduction, and extensively modified/instrumented one-of-a-kind aircraft. Funds pay for overhead test infrastructure depot level maintenance such as: Programmed Depot Maintenance (PDM), the calendar-based cyclic scheduling of aircraft into depots for update/inspection; modifications and any other depot level repairs required by the aircraft System Program Directors (SPD); engine overhauls; depot-provided area assistance; and assorted ground support equipment overhauls. Aircraft Support requirements and funding moved to Test and Evaluation Support, project 06TS, for FYs 98-03. This change eliminates the misunderstanding that Aircraft Support requirements are independent of Test and Evaluation Support when they are, in fact, dependent on one another, contribute to the same mission, and operate under the same reimbursable guidelines. Aircraft Support services and provided via project orders to AF Working Capital Fund (AFWCF) business areas located at the AF logistics centers.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 8,022 AFFTC aircraft programmed depot maintenance and special purpose vehicles maintenance.
- (U) \$ 2,021 AFFTC aircraft engine overhauls
- (U) \$ 1,122 AFDTC aircraft programmed depot maintenance and special purpose vehicles maintenance.
- (U) \$ 266 AFDTC aircraft engine overhauls
- (U) \$11,431 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Not applicable.

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Not applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt	PROJECT 06MC
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
06MC Minor Construction (3,4)	3,500	0	0	0	0	0	0	0	TBD

(1) Approximately 50% of FY98-03 content and funding for Minor Construction, project 06MC, was transferred to PE 0605876F. This transfer provides better focus and alignment of resources for non-test, common base operations support functions at Arnold, Eglin and Edwards AFBs. The other 50% of content was identified specifically as test mission support requirements and accordingly transferred to project 06TS.

(U) A. Mission Description and Budget Item Justification: This project provides essential minor construction at three AFMC installations: Eglin AFB FL, Edwards AFB CA, and Arnold AFB TN. Physical plant maintained by this account covers 800,000 acres of land; over four thousand structures in excess of 30 years old encompassing fifteen million square feet; over five million square yards of airfield pavement; 1900 miles of road network; utility systems that include 120 wells, 10 sewage treatment plants, 20 substations and over 1600 miles of high voltage electrical distribution lines. Minor construction contracts are awarded on the basis of full and open competition.

(U) FY 1997 (\$ in Thousands):

- (U) \$3,500 Financed in-house work performed by government employees (to include supplies, materials and equipment). Finance construction of Human Resource Development Computer Laboratory, replace plenum escape system transformer and add 16KV circuit breaker to plenum escape system substation; and finance addition to equipment research laboratory and provide additional well reservoir.
- (U) \$3,500 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Not applicable.

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Not applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																													
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt	PROJECT 06MC																																													
<p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">3,640</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">Cont</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">3,717</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional Reductions</td> <td style="text-align: right;">-197</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. Bosnia supplemental</td> <td style="text-align: right;">-5</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Below Threshold Reprogramming</td> <td style="text-align: right;">-15</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">3,500</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">Cont</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Funding: FY97 below threshold reprogramming of \$15 thousand for Base Operations Support requirements at Eglin, Edwards and Arnold AFBs.</p> <p>Schedule: None.</p> <p>Technical: None.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u> Not applicable.</p> <p>(U) D. <u>Schedule Profile:</u> Numerous minor construction requirements are executed each year . Detailed data available upon request.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	3,640	0	0	Cont	(U) Appropriated Value	3,717				(U) Adjustments to Appropriated Value					a. Congressional Reductions	-197				b. Bosnia supplemental	-5				c. Below Threshold Reprogramming	-15				(U) Adjustments to Budget Years Since FY 1998 PB					(U) Current Budget Submit/FY 1999 President's Budget	3,500	0	0	Cont
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>																																											
(U) Previous President's Budget (FY 1998 PB)	3,640	0	0	Cont																																											
(U) Appropriated Value	3,717																																														
(U) Adjustments to Appropriated Value																																															
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(U) Adjustments to Budget Years Since FY 1998 PB																																															
(U) Current Budget Submit/FY 1999 President's Budget	3,500	0	0	Cont																																											
Project 06MC	Page 17 of 19 Pages	Exhibit R-2 (PE 0605807F)																																													

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605807F Test And Evaluation Spt	PROJECT 06MR
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
06MR Maintenance and Repair (3,4)	71,569	0	0	0	0	0	0	0	TBD

(1) Approximately 75% of FY98-03 content and funding for Maintenance and Repair, project 06MR, was transferred to PE 0605878F. This transfer provides better focus and alignment of resources for non-test, common base operations support functions at Arnold, Eglin and Edwards AFBs. The other 25% was identified specifically as test facility maintenance and repair requirements and was accordingly transferred to project 06TS.

(U) **A. Mission Description and Budget Item Justification:** This project provides essential Real Property Maintenance and Repair at three AFMC Bases whose host units are MRTFB activities: Eglin AFB FL, Edwards AFB CA, and Arnold AFB TN. Physical plant maintained by this account covers 800,000 acres of land; over four thousand structures in excess of 30 years old encompassing fifteen million square feet; over five million square yards of airfield pavement; 1900 miles of road network; utility systems that include 120 wells, 10 sewage treatment plants, 20 substations and over 1600 miles of high voltage electrical distribution lines. Maintenance and Repair contracts for services or projects are awarded on the basis of full and open competition.

(U) FY 1997 (\$ in Thousands):

- (U) \$37,195 Financed in-house work force.
- (U) \$13,661 Repaired refrigerant insulation, rotor discs, gaseous helium refrigerators, heaters in air processing system and water control valves.
- (U) \$12,215 Repaired various roads, underground cable, HVAC (heating, ventilation and air conditioning), airfield pavement, electrical distribution lines , and asbestos abatement, seismic studies, and re-roof buildings.
- (U) \$8,498 Repaired "unsatisfactory" conditions as determined by the Commander's Facility Assessment.
- (U) \$71,569 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Not applicable.

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Not applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605808F Development Planning	PROJECT 3361
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3361 Mission & System Planning	6,401	4,270	6,075	5,800	5,860	5,951	6,103	TBD	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This Program Element (PE) supports the Air Force Modernization Planning Process (MPP), which receives front-end guidance from Air Force long-range, strategic planning. Consistent with DoD 5000 series direction, the PE enables rigorous identification and substantiation of current/future operational deficiencies and needed capability, as well as associated migration plans. Such modernization planning efforts can be categorized according to three phases. First, a “strategies-to-task”, Mission Area Assessment (MAA) is conducted to identify operational tasks. These operational tasks must relate directly to currently assigned or future Air Force roles and missions as derived from a number of sources including the Air Force Vision and Strategic Plan. Second, a Mission Needs Analysis (MNA) is conducted to assess current and programmed force capabilities against operational tasks and ultimately identify specific deficiencies and needs. The third phase of the MPP is Mission Solution Analysis (MSA), which identifies potential cost effective, non-materiel (i.e. doctrine, tactics, training) and materiel alternatives that address the deficiencies/needs, or simply represent new organizational, operational, and/or technological opportunities. This program is in budget activity 6, Management Support, because supported studies and analyses provide inputs for Air Force Mission Area and/or Support Plans and future Air Force investment decisions. However, Phase 0 concepts studies and Analysis of Alternatives (AOAs) are not normally conducted in this program element.

(U) Acquisition Strategy

Annually, an Air Force-wide corporate board reviews, prioritizes, and screens proposed studies to ensure warfighter relevance and no unnecessary duplication of effort.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605808F Development Planning	PROJECT 3361
(U) <u>FY 1997 (\$ in Thousands):</u>		
– (U) \$1,264	Continued surveillance and reconnaissance mission area study to identify architecture alternatives to support the battlefield commander.	
– (U) \$427	Initiated analysis of the Aeromedical Evacuation mission and environment during contingency operations.	
– (U) \$446	Continued effort to adapt existing air mobility modeling and simulation tools to distributed interactive simulation (DIS) standards to support mobility MAAs.	
– (U) \$56	Continued effort to identify comprehensive measures of merit and effectiveness of space and missile systems to support analyses.	
– (U) \$995	Developed analytical baseline of life cycle cost of ownership of weapon systems to support Air Combat Command's (ACC) mission area planning.	
– (U) \$710	Performed study to support MNA for the Special Operations Forces Provide Mobility in Denied Territory mission area.	
– (U) \$282	Provided assessment of deficiencies in various fleet mixes of intratheater airlift aircraft and the impact of the deficiencies on a campaign.	
– (U) \$493	Continued effort to project sizing requirements for the communications pipeline to and from Air Mobility Command bases and deployed sites.	
– (U) \$207	Performed analysis of combat identification architectures to address correlating off board sensor data with shooter on-board fire control data.	
– (U) \$440	Initiated establishment of objective and quantifiable methodology to examine integrated warfighting concepts across ACC mission areas.	
– (U) \$263	Developed a methodology to analyze and optimize airpower allocations within a theater campaign.	
– (U) \$141	Developed a family of optimized mixes of space and missile systems/concepts over a 25-year horizon.	
– (U) \$305	Identified and analyzed AF Medical Service casualty management requirements from future biowarfare or directed energy weaponry.	
– (U) \$372	Continued Air Education and Training Command's (AETC) Training Throughput Model project.	
– (U) \$6,401	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) \$457	Complete study to support MNA for AF Special Operation Command's (AFSOC) Provide Mobility in Denied Territory mission area.	
– (U) \$140	Initiate efforts to identify opportunities to streamline, consolidate, and automate AF Modernization Planning processes.	
– (U) \$1,002	Continue surveillance and reconnaissance mission area study to identify architecture alternatives to support the battlefield commander.	
– (U) \$1,119	Continue analysis of optimized space and missile capabilities, and force structure trades across all space mission areas.	
– (U) \$653	Initiate analysis of integration and interdependencies of land and sea transportation to allow determination and optimal mix of mobility resources.	
– (U) \$899	Continue efforts to base line and forecast operations and support, modernization and infrastructure costs for combat aircraft and training systems.	
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DATE
February 1998

BUDGET ACTIVITY
6 - Management and Support

PE NUMBER AND TITLE
0605808F Development Planning

- (U) \$4,270 Total

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605808F Development Planning	PROJECT 3361
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(U) FY 1999 (\$ in Thousands):

- (U) \$300 Continue efforts to identify opportunities to streamline, consolidate, and automate AF Modernization Planning processes.
- (U) \$1,400 Continue surveillance and reconnaissance mission area study to identify architecture alternatives to support the battlefield commander.
- (U) \$600 Continue analysis of optimized space and missile capabilities, including force structure trades, across all space mission areas
- (U) \$495 Continue to strengthen linkages between ACC mission area deficiencies and modernization investment.
- (U) \$410 Continue analysis of the Aeromedical Evacuation mission and environment during contingency operations.
- (U) \$2,870 Initiate/continue specific efforts in support of AF Modernization Planning.
- (U) Further definitization subsequent to FY 99 program spring review scheduled for February 1998.
- (U) \$6,075 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998) PB	6,194	6,049	6,197	Continuing
(U) Appropriated Value	6,531	4,549		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-185	-171		
b. SBIR	-152	-108		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming (BTR)	+218			
e. Recissions	-11			
(U) Adjustments to Budget Years Since FY 1998 PB			-122	
(U) Current Budget Submit/1999 President's Budget	6,401	4,270	6,075	Continuing

(U) Change Summary Explanation:

Funding: FY97 BTR supports additional study efforts. FY 99 adjustment reflects revised inflation estimates.
 Schedule: Not Applicable.
 Technical: Not Applicable.

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605808F Development Planning	PROJECT 3361
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(U) C. Other Program Funding Summary (\$ in Thousands) None.

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
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(U)

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Execute projects	X	X	X	X	X	X	X	X	X	X	X	X

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605854F Pollution Prevention	PROJECT 1007
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1007 Pollution Prevention	19,723	9,251	1,673	2,600	2,615	2,751	2,818	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

For FY97-98 this program element funds pollution prevention efforts required to accomplish the objectives and subobjectives of the Air Force Pollution Prevention Strategy to include installation level programs at Air Force Material Command Major Range and Test Facility bases (Eglin, Arnold, and Edwards AFBs) and cross-cutting weapons systems pollution prevention tools. It also funds efforts to validate and qualify environmentally acceptable materials and processes to replace existing common hazardous materials and processes. The account provides funds for Class 0 (recurring work to keep the gates open) and Class 1 (work required to eliminate dependence on ozone depleting chemicals, work to correct current non-compliance with federal, state or local environmental laws, and work required to satisfy pollution prevention Executive Orders). Typical services and projects include: eliminating ozone depleting chemicals and hazardous materials; reducing the generation of hazardous waste, air emissions, and solid wastes; establishing and operating recycling and composting programs; and establishing and operating hazardous material pharmacies and centralized hazardous material tracking programs.

Beginning in FY99, all funds for Test Facility base operations support (RDT&E) will be transferred to operations and maintenance. Remaining RDT&E funds will be used for development and test efforts to validate and qualify environmentally acceptable materials and processes to replace existing common hazardous materials and processes, cross-cutting weapons systems pollution prevention tools, and management and support costs in direct support of development efforts to meet compliance problems. This program is in Budget Activity 6, Management and Support, because most of the funding is directed toward support of test facilities required for general research and development use.

(U) Acquisition Strategy:

Funds for this PE are associated to many acquisition projects in other programs, thus acquisition strategy is not applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	0605854F Pollution Prevention	1007
(U) <u>FY 1997 (\$ in Thousands):</u>		
– (U) 662	Manpower and Education and Training	
– (U) 1,396	Class 0 Projects: Opportunity assessments, contractor support, management action plan updates, computer support, hazardous material pharmacy supplies and equipment, and community awareness activities.	
– (U) 356	Resource Conservation and Recovery Act (RCRA) Subtitle C - Hazardous Waste	
– (U) 84	RCRA Subtitle D - Solid Waste	
– (U) 251	Clean Air Act	
– (U) 21	Clean Water Act	
– (U) 1,277	Hazardous Material Reduction	
– (U) 105	Other	
– (U) 15,571	Class I Dem/Val Projects: Validation and qualification of commercially available material, equipment, and processes to support the Montreal Protocol and Air Force Pollution Prevention Strategy objectives and subobjectives in accordance with the Environmental Research and Development Strategic Plan. The demonstration/validation phase is system specific and includes advanced technology demonstrations that help expedite technology transition from the laboratory to operational use to meet compliance problems.	
– (U) 19,723	Total	
(U) <u>FY 1998 (\$ in Thousands):</u>		
– (U) 583	Manpower and Education and Training	
– (U) 791	Class 0 Projects: Opportunity assessments, contractor support, management action plan updates, computer support, hazardous material pharmacy supplies and equipment, and community awareness activities.	
– (U) 580	RCRA Subtitle C - Hazardous Waste	
– (U) 245	RCRA Subtitle D - Solid Waste	
– (U) 142	Clean Air Act	
– (U) 192	Clean Water Act	
– (U) 724	Hazardous Material Reduction	
– (U) 3,084	Other	
– (U) 2,910	Class I Dem/Val Projects: Validation and qualification of commercially available material, equipment, and processes to support the Montreal Protocol and Air Force Pollution Prevention Strategy objectives and subobjectives in accordance with the Environmental Research and Development Strategic Plan. The demonstration/validation phase is system specific and includes advanced technology demonstrations that help expedite technology transition from the laboratory to operational use to meet compliance problems.	
– (U) 9,251	Total	
Project 1007	<i>Page 2 of 4 Pages</i>	Exhibit R-2 (PE 0605854F)

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BUDGET ACTIVITY
6 - Management and Support

PE NUMBER AND TITLE
0605854F Pollution Prevention

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605854F Pollution Prevention	PROJECT 1007																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 294 RCRA Subtitle C - Hazardous Waste - (U) 197 RCRA Subtitle D - Solid Waste - (U) 294 Clean Air Act - (U) 100 Clean Water Act - (U) 688 Hazardous Material Reduction - (U) 100 Other - (U) 1,673 Class I Dem/Val Projects: Validation and qualification of commercially available material, equipment, and processes to support the Montreal Protocol and Air Force Pollution Prevention Strategy objectives and subobjectives in accordance with the Environmental Research and Development Strategic Plan. The demonstration/validation phase is system specific and includes advanced technology demonstrations that help expedite technology transition from the laboratory to operational use to meet compliance problems. 																																																									
<p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget FY1998 PB</td> <td style="text-align: right;">19,756</td> <td style="text-align: right;">5,880</td> <td style="text-align: right;">4,314</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">20,628</td> <td style="text-align: right;">9,880</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Congressional General Reductions</td> <td style="text-align: right;">-470</td> <td style="text-align: right;">-441</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-402</td> <td style="text-align: right;">-188</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescission</td> <td style="text-align: right;">-33</td> <td></td> <td></td> <td></td> </tr> <tr> <td> f. Adjustments to Budget Years since FY1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-2,641</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/1999 President's Budget</td> <td style="text-align: right;">19,723</td> <td style="text-align: right;">9,251</td> <td style="text-align: right;">1,673</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p>Funding: A Congressional Add of \$4M in FY98 for an automated monitoring network demonstration for in-ground real-time monitoring of aquifers is included and is undergoing reclassification to O&M. Adjustments to FY99 include a transfer of all funds for Test Facility base operations support from RDT&E to O&M.</p> <p>Schedule: Not Applicable</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget FY1998 PB	19,756	5,880	4,314	TBD	(U) Appropriated Value	20,628	9,880			(U) Adjustments to Appropriated Value					a. Congressional General Reductions	-470	-441			b. SBIR	-402	-188			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescission	-33				f. Adjustments to Budget Years since FY1998 PB			-2,641		(U) Current Budget Submit/1999 President's Budget	19,723	9,251	1,673	TBD
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Project 1007	Page 3 of 4 Pages	Exhibit R-2 (PE 0605854F)																																																							

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605854F Pollution Prevention	PROJECT 1007
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Technical: Not Applicable

(U) C. Other Program Funding Summary (\$ in Thousands) Not Applicable

(U) D. Schedule Profile All funds except for the Congressional Add are associated with many projects in other acquisitions programs, thus management of project schedule is not accomplished within this PE. These funds are used to ensure pollution prevention applications are developed during other Air Force acquisition programs. The following schedule tracks the Congressional Add.

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract Award							X					
(U) Site Monitoring Plan								X				
(U) Sensor Testing								X				
(U) Install Network										X		
(U) Long-Term Monitoring											X	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605860F Rocket System Launch Program (Space)	PROJECT 1023
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1023 Reentry System Launch PGM (RSLP)	32,165	26,348	7,865	8,057	8,128	8,249	8,412	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

(U) Rocket System Launch Program (RSLP) is tasked to provide Research, Development, Test and Evaluation (RDT&E) launch vehicle support to DoD and other government agencies using excess ballistic missiles assets. RSLP mission was established by the Secretary of Defense in 1972. It provides mission planning, payload integration, launch support, booster storage and disposal, maintenance and logistics support for selected DoD RDT&E launches. Costs directly attributable to a specific launch or program are paid by the user (Air Force, Navy, Army, Ballistic Missile Defense Organization (BMDO), etc.). RSLP directly supports deactivation of Minuteman II by providing storage of these and other assets. RSLP performs research and development support operations required for general rocket system launch research and development use.

(U) This program is in Budget Activity 6 - Management and Support because RSLP provides research and development effort and/or operations support for general research and development use.

(U) Acquisition Strategy:

(U) Storage, refurbishment, and aging surveillance are on-going activities using either the Air Force responsible logistics center or the Arizona Army National Guard. Funding provided via military interdepartmental purchase request and/or interservice support agreement.

(U) Flight tests will be conducted by exercising task orders on the competitively awarded RSLP Sounding Rocket Program contract.

(U) FY 1997 (\$ in Thousands):

- (U) \$5,765 Continued storage and refurbishment of deactivated Minuteman and other missile flight test assets.
- (U) \$2,000 Performed aging surveillance-related activities on stored motors; performed analyses/studies to identify and evaluate potential safety-related issues affecting stored motors.
- (U) \$24,184 Initiated development of atmospheric interceptor technology, plasma attenuation, and materials demonstration flight testing for BMDO.
- (U) \$216 Other
- (U) \$0 Provided launch assets and technical assistance for DoD RDT&E launches. (Funded by users.)
- (U) \$32,165 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605860F Rocket System Launch Program (Space)	PROJECT 1023																																																							
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$6,013 Continued storage and refurbishment of deactivated Minuteman and other missile flight test assets. - (U) \$2,000 Continued performing aging surveillance-related activities on stored motors; continued performing analyses/studies to identify and evaluate potential safety-related issues affecting stored motors. - (U) \$18,152 Continued development of atmospheric interceptor technology (AIT). - (U) \$183 Funding set aside for pending reprogramming to fund higher priorities. - (U) \$0 Continued providing launch assets and technical assistance for DoD RDT&E launches. (Funded by users.) - (U) \$26,348 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$6,023 Continue storage and refurbishment of deactivated Minuteman and other missile flight test assets. - (U) \$1,842 Continue performing aging surveillance-related activities on stored motors; continue performing analyses/studies to identify and evaluate potential safety-related issues affecting stored motors. - (U) \$0 Continue providing launch assets and technical assistance for DoD RDT&E launches. (Funded by users.) - (U) \$7,865 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">32,218</td> <td style="text-align: right;">8,013</td> <td style="text-align: right;">8,023</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">33,252</td> <td style="text-align: right;">28,013</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td style="text-align: right;">-705</td> <td style="text-align: right;">-1,006</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-329</td> <td style="text-align: right;">-659</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: right;">0</td> <td style="text-align: right;">0</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: right;">-53</td> <td style="text-align: right;">0</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-158</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">32,165</td> <td style="text-align: right;">26,348</td> <td style="text-align: right;">7,865</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	32,218	8,013	8,023	Continuing	(U) Appropriated Value	33,252	28,013			(U) Adjustments to Appropriated Value					a. Cong Reductions	-705	-1,006			b. SBIR	-329	-659			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	0	0			e. Rescissions	-53	0			(U) Adjustments to Budget Years Since FY 1998 PB			-158		(U) Current Budget Submit/FY 1999 President's Budget	32,165	26,348	7,865	Continuing
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BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 0605860F Rocket System Launch Program (Space)			PROJECT 1023																																																																														
<p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: Congress added \$20,000 to FY98 PB request to support AIT Program. Reductions in FY99 and beyond to offset higher Air Force and DOD needs.</p> <p style="padding-left: 40px;">Schedule: No significant impact.</p> <p style="padding-left: 40px;">Technical: An additional flight test added in FY99 to support AIT.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>: None.</p> <p>(U) D. <u>Schedule Profile</u>:</p> <table style="width: 100%; border: none;"> <thead> <tr> <th style="width: 25%;"></th> <th colspan="4" style="text-align: center;"><u>FY 1997</u></th> <th colspan="4" style="text-align: center;"><u>FY 1998</u></th> <th colspan="4" style="text-align: center;"><u>FY 1999</u></th> </tr> <tr> <th></th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> </tr> </thead> <tbody> <tr> <td>(U) Storage/Refurbishment</td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>(U) Aging Surveillance</td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <td>(U) Flight Tests</td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td style="text-align: center;">X</td><td></td><td></td> </tr> <tr> <td style="padding-left: 20px;">* Started and/or Completed</td> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> <td></td><td></td><td style="text-align: center;">X</td><td style="text-align: center;">X</td> </tr> </tbody> </table>									<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>					1	2	3	4	1	2	3	4	1	2	3	4	(U) Storage/Refurbishment													(U) Aging Surveillance													(U) Flight Tests										X			* Started and/or Completed											X	X
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>																																																																												
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(U) Flight Tests										X																																																																											
* Started and/or Completed											X	X																																																																									
Project 1023		Page 3 of 3 Pages				Exhibit R-2 (PE 0605860F)																																																																															

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605864F Space Test Program (Space)	PROJECT 2617
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2617 Free-Flyer Spacecraft Missions	0	0	45,933	55,099	56,520	53,580	55,357	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: This is not a new start. Space Test Program (Space) PE 0603402F changes to PE 0605864F in FY99. Prior year funding is in PE 0603402F.

(U) A. Mission Description and Budget Item Justification

(U) The Space Test Program (STP) provides support to the DoD space research community by centrally financing acquisition of a host satellite or launch vehicle, the launch, and initial operations costs for experiments with military relevance whose scope ranges from basic research to advanced development. STP missions are the most cost effective way to flight test new space systems technologies, concepts and designs, providing an inexpensive way to:

- Demonstrate the feasibility of new space systems and technologies
- Improve operational design by characterizing the space environment, event, or sensor physics proposed for an operational system/system upgrade
- Provide early operational capabilities to evaluate usefulness or quickly react to new developments
- Perform operational risk reduction through direct flight test of prototype components
- Develop the knowledge base from which to plan new and improved operational systems and system upgrades
- Develop and test advanced small launch vehicle technology and capabilities

This DoD program provides the primary spaceflight capability to perform fly-before-buy, risk-reducing demonstrations of advanced technologies in operational space environments. The Secretary of Defense issued a policy statement in November 1995 reaffirming STP's role as the primary provider of spaceflight for the entire DoD space research community. Space Test Program is a Budget Activity 6 RDT&E Management and Support program.

(U) Acquisition Strategy

(U) The space research experiments that STP supports are justified, developed, financed, and delivered by various Service laboratories and DoD agencies, with the goal of improving DoD's current and future operational space systems' performance. Experiments are considered for spaceflight based on the priority that they are assigned by the annual DoD Space Experiments Review Board, a group that is independent of the STP Program Office, and is comprised of Air Force, Army, Navy, BMDO and other representatives with expertise in DoD operational space requirements. The Board gives the prioritized list of experiments to STP, who then seeks out the most cost effective means of spaceflight to maximize the number of experiments flown within the constraints of priority, opportunity and available funding. The most common spaceflight opportunities include piggybacking on military or commercial satellites, both foreign and domestic, and the various payload modes of the Space Shuttle. For those experiments whose requirements cannot be satisfied with these "secondary" opportunities, dedicated STP spacecraft and launch vehicle hardware are procured within the constraints of available funding and according to experiment requirements. These include Small and Medium Launch Vehicle class satellites, as well as Small Launch Vehicle class boosters (such as Pegasus, Taurus, and Lockheed Martin Athena). Medium Launch Vehicle class boosters are provided as required by PE 35119F and PE 35953F. If a particular manifested experiment fails to materialize or is deemed impractical to fly given current

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605864F Space Test Program (Space)	PROJECT 2617
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funding, or if the appropriate spaceflight opportunity becomes unavailable, STP shifts what resources remain to provide spaceflight support for the next highest priority experiments.

(U) The Air Force requires a stable funding level and the flexibility necessary to take advantage of whatever means of spaceflight is deemed to be most cost effective for a given experiment or complement of experiments. This flexibility is essential to take advantage of inexpensive "target of opportunity" space hardware, including operational spacecraft, where margin is usually firmly identified during the later stages of spacecraft development. This assures that the greatest amount of DoD space research is accomplished with the limited funds available. Without the requested funding, DoD would lose its most successful and most cost-effective capability to launch and test new technologies prior to their incorporation into our nation's very expensive and demanding operational space systems. Insufficient funding would also force each of the Services and DoD agencies to create individual launch capabilities in an attempt to duplicate STP's current low-cost, risk mitigating capability. Such a redundancy would result in the loss of the contractual economy of scale that a single space test organization provides, as well as the filtering function of the DoD Space Experiments Review Board in assuring quality experiments and minimum duplication.

(U) FY 1999 (\$ in Thousands)

- (U) \$ 8,815 Piggyback/secondary payload missions; mission planning, Aerospace Corp support, mission and program support.
- (U) \$ 3,500 Space Shuttle payload engineering, analysis, pre- and post-launch processing, and launch support.
- (U) \$26,149 Begin dedicated STP EELV mission (RAIDS, WINDSAT, and ISUS satellites, etc.); TSX-5 and ARGOS ops; reusable upper stage/bus devel
- (U) \$ 7,469 Continue JAWSAT and MTI Taurus Launch Vehicle development.
- (U) \$45,933 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	0	0	0	Continuing
(U) Appropriated Value				
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions				
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescission				
(U) Adjustments to Budget Years Since FY1998 PB			45,933	
(U) Current Budget Submit/FY1999 President's Budget	0	0	45,933	Continuing

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 0605864F Space Test Program (Space)	PROJECT 2617
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(U) Change Summary Explanation:

Funding: Space Test Program (Space) PE 0603402F changes to PE 0605864F in FY99. Prior year funding is in PE 0603402F.

Schedule: STP EELV mission moved from FY01 to FY02.

Technical: Not Applicable.

(U) **C. Other Program Funding Summary (\$ in Thousands):**

Not Applicable.

Related RDT&E:

- (U) PE 0305119F, Medium Launch Vehicles
- (U) PE 0305953F, Evolved Expendable Launch Vehicle
- (U) PE 0603402F, Prior year STP funding

Experiments are funded by many Science and Technology (S&T) PEs in Air Force, Army, Navy, DARPA, BMDO, DoE, NASA, and other programs.

(U) **D. Schedule Profile** These are anticipated launch dates. (Current projection. Experiments are added as new spaceflight opportunities and budget permits).

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) STS-93* STL-B, CCM-A, MSX, LFSAH, SIMPLEX, MEMS									X			
(U) STS-95* CRYOTSU, MSX, MEMS, CCM-A, PANSAT, SIMPLEX, TASBE									X			
(U) TSX-5 - STRV II, CEASE (P95-2)									X			
(U) PICOSAT - PBEX, IOX, CERTO, OPPEX (P97-1)*										X		
(U) CEASE (STRV1 C/D) (S97-1)*											X	
(U) CERTO PLUS (STRV1 C/D) (S97-2)*											X	
(U) POGS-II (S92-1)												X
(U) JAWSAT (TtANOS, IOX, CERTO)*												X

*New spaceflight opportunity since FY98PB.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 1001004F International Activities
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	3,548	3,591	3,752	3,818	3,880	3,936	3,982	Continuing	TBD
0AH *Shape Tech Center-VKI-ICRD Sup	3,548	0	0	0	0	0	0	0	0
4645 *International Cooperative Research & Development	0	3,591	3,752	3,818	3,880	3,936	3,982	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

*The BPAC title was changed and a new project number assigned for administrative purposes to accurately reflect the nature of work being accomplished. FY97 and prior funding is reflected in BPAC Project 00AH, FY98 and outer years have been reassigned to BPAC Project 4645.

(U) A. Mission Description and Budget Item Justification

The mission of this program is to gain access to our allies best defense technologies, eliminate costly duplication of research and development efforts, accelerate availability of defense systems, and to deploy and sustain common or interoperable USAF and Allied equipment through international cooperative research and development.

The USAF is party to multiple international cooperative agreements to solve common US and Allied military scientific and technological problems and to develop materiel solutions to harmonize coalition requirements. This program funds the Department of the Air Force to support, develop, process, negotiate, implement, and manage these international cooperative agreements and projects in compliance with statutory reporting provisions and exacting legal statutes, fiscal constraints, technology transfer controls, intellectual property rights, third party transfer provisions, quid-pro-quo criteria, industrial base factors, and political-military interests. Included in this budget are domestic and international technology assessment teams; specialized working groups; long-term technology project developments; support for cooperative opportunity assessments; developing, processing, and negotiating international agreements; oversight of International Cooperative Research and Development (ICR&D) projects; overseas R&D liaison and coordination offices; bilateral and multilateral staff talks; and the Engineering and Scientist Exchange Program (ESEP). Funds US participation in the NATO Air Force Armaments Group (NAFAG) and NATO Research and Technology (RTO). This program is in Budget Activity 6, Management and Support, because it provides for general Research & Development Management support for all aspects of International Research & Development in the USAF.

(U) Acquisition Strategy:

This program element is the only source of USAF funds to identify and initiate opportunities for international armament's cooperation to (a) deploy and support common or interoperable equipment with our allies; (b) leverage USAF resources with our allies through cost sharing and economies of scale; and (c) exploit the best US and allied technologies for equipping coalition forces. We obtain these benefits only after international cooperative opportunities are identified, explored, developed, assessed and negotiated and concluded. This program element provides funds to execute up-front armaments cooperation

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 1001004F International Activities
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responsibilities, rationalize cooperative opportunities, assess allied technologies, and generate sound, cost-effective cooperative programs between the USAF and our international partners. Once these initiatives and programs are started as international efforts they are transferred to the appropriate technology or systems program office and are funded in their own program elements.

(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	3,554	3,715	3,827	
(U) Appropriated Value	3,633	3,715		
(U) Adjustments to Appropriated Value				
a. Congressional Reductions	-76	-121		
b. SBIR	-3	-3		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Recission	-6			
(U) Adjustments to Budget Years Since FY 1998 PB			-75	
(U) Current Budget Submit/President's Budget	3,548	3,591	3,752	

(U) Change Summary Explanation:
 Funding: NA
 Schedule: N/A
 Technical: N/A

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) N/A									

(U) D. Schedule Profile

(U) See Individual Projects

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BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 1001004F International Activities				PROJECT 0AH		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
0AH *Shape Tech Center-VKI-ICRD Sup	3,548	0	0	0	0	0	0	0	0	
(U) A. <u>Mission Description and Budget Item Justification</u>										
<p>The mission of this program is to gain access to our allies best defense technologies, eliminate costly duplication of research and development efforts, accelerate availability of defense systems, and to deploy and sustain common or interoperable USAF and Allied equipment through international cooperative research and development.</p> <p>The USAF is party to multiple international cooperative agreements to solve common US and Allied military scientific and technological problems and to develop materiel solutions to harmonize coalition requirements. This program funds the Department of the Air Force to support, develop, process, negotiate, implement, and manage these international cooperative agreements and projects in compliance with statutory reporting provisions and exacting legal statutes, fiscal constraints, technology transfer controls, intellectual property rights, third party transfer provisions, quid-pro-quo criteria, industrial base factors, and political-military interests. Included in this budget are domestic and international technology assessment teams; specialized working groups; long-term technology project developments; support for cooperative opportunity assessments; developing, processing, and negotiating international agreements; oversight of International Cooperative Research and Development (ICR&D) projects; overseas R&D liaison and coordination offices; bilateral and multilateral staff talks; and the Engineering and Scientist Exchange Program (ESEP). Funds US participation in the NATO Air Force Armaments Group (NAFAG) and NATO Research and Technology Organization (RTO).</p>										
(U) <u>FY 1997 (\$ in Thousands):</u>										
<ul style="list-style-type: none"> - (U) \$110 NATO C3 Agency (formally Shape Technical Center) - Funded US R&D coordination office and administrative support to US engineering and technical professionals assigned to the NATO C3 Agency. - (U) \$253 ESEP - Funded the management oversight of the Engineer and Scientist Exchange Program. 										
Project 0AH			<i>Page 3 of 13 Pages</i>				Exhibit R-2 (PE 1001004F)			

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BUDGET ACTIVITY

6 - Management and Support

PE NUMBER AND TITLE

1001004F International Activities

- (U) \$500 **NATO Research & Technology Organization (RTO, formerly AGARD)** - Fully funded US national-level representation to the NATO R&T Board. Funded technical experts from Air Force field-level, US industry, and universities to support 7 technical panels, 21 working groups, 3 study groups, and 1 study committee sponsored by NATO RTO. FY97 program of work as endorsed by US National Delegates and approved by the AGARD National Delegates Board and NATO Military Committee included: (1) Injury Prevention In Aircraft Crashes: Investigative Techniques and Applications, (2) Manned Combat Aircraft-highlights of Future Technological Developments for Improved Affordability and Combat Effectiveness, (3) Aging Combat Aircraft Fleet-Long Term Implications, (4) Helicopter/Weapon System Integration, (5) Fully Automated Conduct Air Traffic Management, (6) Strategic Management of the Cost Problem of Future Weapon Systems, (7) Advanced Non-Intrusive Instrumentation for Propulsion Engines, (8) Multisensors Systems and Data Fusion for Telecommunications, Remote Sensing and Radar, (9) System Design Considerations for Unmanned Tactical Aircraft, (10) Sustained Hypersonic Flight: From Demonstration to Applications, (11) Propulsion, (12) Critical Technology Advances in Military Aerospace Support Systems, (13) Operational Enhancements via Human System Technologies. Continued Partnership for Peace initiative through the NATO RTO outreach program incorporating new scientist and engineers from Central Europe.
- (U) \$268 **AFIPSA** -Fully funded AFIPSA and USAF to reduce the backlog of proposals for International Cooperative R&D Agreements. The following is a list of agreements that were signed in FY97: **Australia:** Adaptive Flexible Structures for Air Vehicle Application, GPS Ionospheric Scintillation Monitors, MOU for Loan of TASLU Phase II Aircraft Cargo; **Four Powers:** Aircraft Armament Avionic Agility, Post-2020 Armament Concepts and Technologies, Tactical Missile Propellants (Rev.1), Aircraft Battle Damage Repair (Rev. 1); **France:** Reliability of Electronic Components and Equipment; **Germany:** Free Piston Shock Tunnel, Optical Properties of the Environment; **Israel:** Strengthening of Concrete Structures for Enhanced Structural Survivability, Construction and Engineering in the Air Force, Diagnostics of Chemical Oxygen-Iodine Lasers; **Japan:** Aerodynamic Test Technology; **Poland:** Aircrew Simulation & Performance; **Russia:** Cooperate in Installing and Operating Seismic Stations for Monitoring Nuclear Weapons Tests; **Sweden:** Technology Research & Development Project; **United Kingdom:** Dense Metal Case Penetrating Weapon; Aftbody/Nozzle Aeroacoustics Project; Programmable Integrated Ordinance Suite; Penetration, Target Acquisition and Attack Technologies for Air Vehicles; Tactical Imagery Data Management and Exploitation; Atlas Aircraft Cargo Loader.
- (U) \$1,183 **ICR&D** - Funded USAF overseas R&D liaison offices. Funded management support and oversight of USAF Foreign Comparative Test Program and NATO Cooperative R&D Program. Funded USAF participation at the NATO Four-power Council, NAFAG, and its six subgroups to promote NATO harmonization of requirements, standardization, and new cooperative R&D programs. Funded USAF participation at the US-Japan Systems and Technology Forum it's four sub-groups and international CALS. Funded expanded technology acquisition contacts and follow-on cooperative opportunities with Russia, Ukraine, and Eastern Europe. Partially funded technical assessments and international agreements negotiation start-up costs associated with promising cooperative R&D programs. This PE also funded preliminary and negotiation costs associated with USAF NATO cooperative R&D funded programs. Funded support for the NATO AWACS Board of Directors and the Air Force Technology Booth at International Forums.

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BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 1001004F International Activities			PROJECT 0AH																																																																												
<p>– (U) \$1,234 AFMC - Fully funded Air Force Material Command activities to identify, assess, and develop support packages and project arrangements as required by statute for the above cited new candidate agreements. Funded Material Command initiatives and technical support to the Chair of the NAFAG. Supported Material Command activities for USAF Foreign Comparative Test and NATO Cooperative R&D Programs. Funded USAF participation in panel meetings of the Technical Cooperation Program, Air Standardization Coordinating Committee, Standard NATO Agreements Working Groups, and NATO Alliance Ground Surveillance Program Office. Funded exploratory visits to France, Germany, Israel, United Kingdom and other countries on new technology exchange projects. Funded the International Focal Point Offices program offices at centers and laboratories in identifying, creating and staffing new international cooperative agreements. Funded the support, management and documentation of all of the above ICR&D efforts.</p> <p>– (U) \$3,548 Total</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget</td> <td style="text-align: right;">3,554</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">3,633</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Congressional Reductions</td> <td style="text-align: right;">-76</td> <td></td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-3</td> <td></td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Recission</td> <td style="text-align: right;">-6</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY1997 PB</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Current Budget Submit FY1999/President's Budget</td> <td style="text-align: right;">3,548</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: N/A Schedule: N/A Technical: N/A</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:10%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>FY 2000</u></th> <th style="text-align: center;"><u>FY 2001</u></th> <th style="text-align: center;"><u>FY 2002</u></th> <th style="text-align: center;"><u>FY 2003</u></th> <th style="text-align: center;"><u>To Compl</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) N/A</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget	3,554				(U) Appropriated Value	3,633				(U) Adjustments to Appropriated Value					a. Congressional Reductions	-76				b. SBIR	-3				c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Recission	-6				(U) Adjustments to Budget Years Since FY1997 PB					(U) Current Budget Submit FY1999/President's Budget	3,548					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>	(U) N/A									
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Project 0AH				Page 4 of 13 Pages			Exhibit R-2 (PE 1001004F)																																																																												

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 1001004F International Activities	PROJECT 0AH
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(U) **D. Schedule Profile**

	<u>FY 1997</u>			
	1	2	3	4
(U)				
-NATO C3 Agency Program Review				X
-NATO Research & Technology Board	X		X	
-Aerospace Applications Studies Committee	X	X	X	X
-Bilateral Technology R&D Projects MOUs	X	X	X	X
-Cooperative R&D Projects	X	X	X	X
-Foreign Comparative Testing Prioritization Board		X		
-NATO Cooperative R&D Prioritization Board			X	
-R&D Loans of Defense Equipment	X	X	X	X
-Systems & Technology Forum (JA)	X		X	
-Other Bilateral forums (CA, BZ)	X	X	X	X
-Data/Information Exchange Annexes	X	X	X	X
-Engineer and Scientist Exchanges	X	X	X	X
-NATO Air Force Armaments Group	X		X	
-Four-Power Air Senior National Representatives	X		X	
-Four-Power Long-Term Technology Working Group		X		X

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BUDGET ACTIVITY 6 - Management and Support				PE NUMBER AND TITLE 1001004F International Activities				PROJECT 4645	
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4645 *International Cooperative Research & Development	0	3,591	3,752	3,818	3,880	3,936	3,982	Continuing	TBD
<p>*FY97 and prior year funding is reflected in BPAC Project 00AH. The BPAC title was changed and a new Project Number assigned for administrative purposes to more actively reflect the nature of work being accomplished.</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u> The mission of this program is to gain access to our allies best defense technologies, eliminate costly duplication of research and development efforts, accelerate availability of defense systems, and to deploy and sustain common or interoperable USAF and Allied equipment through international cooperative research and development.</p> <p>The USAF is party to multiple international cooperative agreements to solve common US and Allied military scientific and technological problems and to develop materiel solutions to harmonize coalition requirements. This program funds the Department of the Air Force to support, develop, process, negotiate, implement, and manage these international cooperative agreements and projects in compliance with statutory reporting provisions and exacting legal statutes, fiscal constraints, technology transfer controls, intellectual property rights, third party transfer provisions, quid-pro-quo criteria, industrial base factors, and political-military interests. Included in this budget are domestic and international technology assessment teams; specialized working groups; long-term technology project developments; support for cooperative opportunity assessments; developing, processing, and negotiating international agreements; oversight of International Cooperative Research and Development (ICR&D) projects; overseas R&D liaison and coordination offices; bilateral and multilateral staff talks; and the Engineering and Scientist Exchange Program (ESEP). Funds US participation in the NATO Air Force Armaments Group (NAFAG) and NATO Research and Technology Organization (RTO).</p> <p>This program element funds general R&D management for all USAF international cooperative R&D. This includes management support and execution of projects in (1) Basic Research (2) Concept Exploration (3) Demonstration and Validation and (4) Engineering and Manufacturing Development. Consequently, this program is in Budget Activity 6.</p> <p>(U) <u>Acquisition Strategy:</u> This program element is the only source of USAF funds to identify and initiate opportunities for international armament's cooperation to (a) deploy and support common or interoperable equipment with our allies; (b) leverage USAF resources with our allies through cost sharing and economies of scale; and (c) exploit the best US and allied technologies for equipping coalition forces. We obtain these benefits only after international cooperative opportunities are identified, explored, developed, assessed and after the international agreements are negotiated and concluded. This PE provides funds to execute up-front armaments cooperation responsibilities, rationalize cooperative opportunities, assess allied technologies, and generate sound, cost-effective cooperative programs between the USAF and our international partners. Once these initiatives and programs are started as international efforts they are transferred to the appropriate technology or systems program office and are funded in their own program elements.</p>									
Project 4645			Page 7 of 13 Pages			Exhibit R-2 (PE 1001004F)			

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	1001004F International Activities	4645
(U) FY 1998		
– (U) \$110	NATO C3 Agency - Funds the US R&D Coordination Office and administrative support for the assigned US Engineering and Technical professionals and cooperative research and development activities assigned to the C3 Agency.	
– (U) \$253	ESEP - Funds the Air Force execution and the management oversight of the Engineer and Scientist Exchange Program (ESEP). Funds approximately nine field level military and civilian scientists from Air Force Research Laboratory, in two year tours at selected European and Asian Government Research Laboratories or other Technical Institutions. ESEP Memoranda of Understanding are expected to be in place with 16 countries.	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	1001004F International Activities	4645
<p>– (U) \$268</p> <p>AFIPSA - Fully funds AFIPSA and USAF to reduce the backlog of proposals for International Cooperative R&D Agreements. The following is a list of proposed candidate agreements that will be either signed or under development in FY98: Argentina: Seismic and Infrasonic Monitoring Agreement, Australia: Air Breathing Propulsion Technology, Project Refractive Turbulence, Navigation Warfare, Aging Aircraft Life Prediction/Extension, High Altitude Endurance Unmanned Aerial Vehicle Cooperative Development and Technical Demonstration; Bolivia: Seismic Monitoring Agreement; Botswana: Seismic Monitoring Agreement; Brazil: Ionospheric Experiments, ESEP, External Stores Flight Testing Methods and Techniques, Seismic and Infrasonic Monitoring Agreement; Central African Republic: Seismic Monitoring Agreement; Chile: Ionospheric Research Project, Infrasonic Monitoring Agreement; China: Seismic Monitoring Agreement; Cote D'Ivoire: Seismic Monitoring Agreement; Egypt: Seismic Monitoring Agreement, TRDP; Ethiopia: Seismic Monitoring Agreement; Four Powers: Tactical Laser Hardened Materials, Beyond Visual Range Air-to-Air Missile, Technologies for Airlift Cargo Handling, Supermaneuverability, Precision Airdrop Improvements; France: Effects of the Ionosphere on Communications and Surveillance Systems, Cooperative Development and Evaluation of Ducted Rockets, Advanced Oscillators, Long Range Missile Guidance Inertial Sensors, Advanced Resonators and Oscillators, Advanced Combustor Chamber Concepts Program, Integrated Tactical Aircraft Control Program; Germany: Observations and Modeling for Space Weather, Cooperative Space Measurements, Wind Tunnels and Flight Simulation Facilities, ESEP, Infrasonic Monitoring Agreement; Israel: External Composite Concrete Reinforcement for Enhanced Structural Survivability, Continuous Wave Solar Pumped IBR Laser; Italy: TRDP; Japan: ESEP, Advanced Hybrid Tactical Propulsion, ACES-II Ejection Seat Improvements, Robotics; Kazakstan: Seismic Monitoring Agreement; Korea: Seismic Monitoring Agreement, Modeling and Simulation of Multichip Avionics; Morocco: Seismic Monitoring Agreement; NATO/Multilateral: Exchange of Research & Development Information, Subminiature Data Acquisition and Telemetry Systems, Joint Airborne Navigation and Attack Technology Demonstration Program, Joint Strike Fighter Requirement Validation Cooperation, NATO AEW&C Mid-term Modernization, NATO Joint Stars Cooperative Acquisition Program, Environmental Effects of Component & Equipment Reliability, Air Command/ Control/Communication and Intelligence Capabilities, Trilateral Technology R&D Program, Multiple Warhead System, Effects on Global Positioning Systems, Agent Defeat Weapon; Namibia: Infrasonic Monitoring Agreement; The Netherlands: Anthropometric Accommodation in Crew Systems; New Zealand: Infrasonic Monitoring Agreement; Norway: ESEP; Oman: Seismic Monitoring Agreement; Pakistan: Seismic Monitoring Agreement; Paraguay: Seismic Monitoring Agreement; Poland: ESEP; South Africa: Seismic Monitoring Agreement; Sweden: Automatic Ground Collision Avoidance for Fighter Aircraft, Administrative and Professional Exchange Program; Turkey: Seismic Monitoring Agreement; Turkmenistan: Seismic Monitoring Agreement; United Kingdom: Air Worthiness of Aging Aircraft, Non-Acoustic Technologies, Aero Engine Altitude Testing, Development and Production of a Directional Infrared Countermeasures System, Weather Impact Decision Aids, Cosmic Radiation Environment and Activation Monitor, Air Battle Management, Metal Matrix Composites for Aerospace Applications, Joint Development and Evaluation of Electro-Optic Protection Measures, Active Control Technology and Aircraft Flying Qualities for Military Aircraft, Flight Simulation of Combat Aircraft Sensors, Visual Scenes, and Motion, Covert All Weather Landing Guidance Technology.</p>		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
6 - Management and Support	1001004F International Activities	4645
– (U) \$500	<p>NATO Research & Technology Organization - Funds US National Delegates participation in the NATO R&T Board and USAF, industry, and academia participation in the RTO aerospace related panel activity. The FY98 program of work will consist of studies, technical exchanges, and reports in the following areas: (1) Presentation of the Probable Changes in Information Management and Technology, (2) Hypersonic Experimental and Computational Capabilities, (3) Aeromedical Support issues in Contingency Operations, (4) Advanced Aerodynamic Measurement Technology, (5) Virtual Manufacturing, (6) Numerical Unsteady Aerodynamics and Aeroelastic Simulation, (7) Thermal Barrier Coatings, (8) Advances in Soft Computing Technologies Application in Mission Systems, (9) Effect of Rain, Icing and Deicing Systems on Wing Performance, (10) Turbulence in Compressible Flows, (11) Flight Test Instrumentation, (12) Current Concepts and New Developments in Impact and Escape System Dummy Specifications and Instrumentation, (13) Structural Optimization. Continues Partnership for Peace initiative through the R&T outreach program incorporating new scientists and engineers from Central Europe.</p>	
– (U) \$1,040	<p>ICR&D - Funds USAF overseas R&D liaison offices. Funds management support and oversight of USAF Foreign Comparative Test Program and NATO Cooperative R&D Program. Funds USAF participation at the NATO Four-power Council, NAFAG, and its six subgroups to promote NATO harmonization of requirements, standardization, and new cooperative R&D programs. Funds USAF participation at the US-Japan Systems and Technology Forum, its four sub-groups and the USAF participation in international CALS. Funds expanded technology acquisition contracts and follow-on cooperative opportunities with Russia, Ukraine, and Eastern Europe. Partially funds technical assessments and international agreements negotiation start-up costs associated with promising cooperative R&D programs. Funds preliminary and negotiation costs associated with USAF AWACS NATO cooperative R&D funded programs and support for the NATO AWACS Board of Directors.</p>	
– (U) \$1,420	<p>AFMC - Fully funds Air Force Materiel Command activities to identify, assess, develop and report International Cooperative Agreements as required by statute for new and existing projects. Supports Materiel Command activities for the USAF Foreign Comparative Test, and NATO Cooperative R&D Programs. Funds USAF participation in panel meetings of the Technical Cooperation Program, Air Standardization Coordinating Committee, Standard NATO Agreements Working Groups, and other NATO forums. Funds periodic bilateral meetings to define new areas of possible cooperation, and exploratory visits to France, Germany, Israel, United Kingdom, Canada, and other countries on new technology exchange projects. Funds the project engineers at centers and Air Force Research Laboratory (AFRL) in identifying, creating and staffing new international cooperative agreements. Funds MAJCOM staff to support and promote international research and development cooperation throughout AFMC. Funds support for the Air force Technology Booth at International Forums. Funds small contracts in support of technology initiatives. This program will, in addition, fund the support, management and documentation of these ICR&D efforts.</p>	
– (U) \$3,591	Total	
– (U) FY 1999		
– (U) \$110	<p>NATO C3 Agency - Funds the US R&D Coordination Office and administrative support for the assigned US Engineering and Technical professionals and cooperative Research and Development activities assigned to the NATO C3 Agency.</p>	
– (U) \$253	<p>ESEP - Funds the Air Force execution and the management oversight of the Engineer and Scientist Exchange Program (ESEP). Funds approximately nine field level military and civilian scientists from Air Force Research Laboratory, Product Centers, Test Centers and Air Logistics Centers in two year tours at selected European and Asian Government Research Laboratories or other Technical Institutions. ESEP Memoranda of Understanding are expected to be in place with 18 countries.</p>	
Project 4645	Page 10 of 13 Pages	Exhibit R-2 (PE 1001004F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 1001004F International Activities PROJECT 4645	
<ul style="list-style-type: none"> - (U) \$269 	<p>AFIPSA - Fully funds AFIPSA and USAF to reduce the backlog of proposals for International Cooperative R&D Agreements. Work will continue on agreements developed during FY98 but not signed and work will be initiated on the following and other new agreements: Australia: Data Fusion for over the Horizon Radar, Detection and Tracking of Targets in Clutter, Structural Integrity of Aging Aircraft, Air C3I Capabilities, Virtual Air Commander; Germany: High Energy Laser Technology (COIL); Israel: Non-Linear Frequency Conversion Materials, Thulium Holmium Energy Transfer Modeling; Italy: Real-Time Information in the Cockpit; Korea: 3D Microwave Monolithic Integrated Circuits; NATO/Multilateral: C-130 Integrated Data Environment, Coalition Command Control and Communications Environment, Joint Airborne Navigation and Attack (JOANNA) II; United Kingdom: Effects of Ionization of Hydrocarbon-Air combustion, Effects of Meteor Metals on Communication and Guidance, PIOS Phase II/III, Mass and Performance Estimation Methodology, Turbine Engine Technology, Wind Tunnel Testing.</p>	
<ul style="list-style-type: none"> - (U) \$250 	<p>NATO Research and Technology Organization: Funds USAF participation in the NATO Research and Technology Board and RTO panel activity. The FY99 program of work will consist of studies, technical exchanges, and reports in the following areas: (1) Computational Unsteady Aerodynamic Codes, (2) Multi-facility Wind Tunnel Testing for CFD Validation, (3) Deterministic Spectral Gust Methods, (4) Screening Protocol for Aeromedical Medications, (5) Human Consequences of Superagility, (6) Aeromedical Lessons from Acceleration and Positive Pressure Breathing Research, (7) Aircraft Weapon Compatibility, (8) Flight Control law Development, (9) Ice Accretion and Simulation Evaluation test, (10) Nonlinear Stability and Transition of Swept-Wing Boundary layers, (11) Sensor data Fusion and Integration of Human Element, (12) Integrated Mission Systems Concepts, (13) Gas Turbine Engine Combustion, Emissions and Alternative Fuels, (14) Aging and Surveillance of Solid Gun Propellants, (15) Frequency Assignment, Sparing and Conservation. Continues Partnership for Peace initiative through the R&T outreach program with scientists and engineers from the Former Soviet Union and Central Europe.</p>	
<ul style="list-style-type: none"> - (U) \$1,325 	<p>ICR&D - Funds USAF overseas R&D liaison offices. Funds management support and oversight of USAF Foreign Comparative Test Program and NATO Cooperative R&D Program. Funds USAF participation at the NATO Four-power Council, NAFAG, and its subgroups to promote NATO harmonization of requirements, standardization, and new cooperative R&D programs. Funds USAF participation at the US-Japan Systems and Technology Forum, its four sub-groups and USAF participation in international CALS. Funds expanded technology acquisition contracts and follow-on cooperative opportunities with Russia, Ukraine, and Eastern Europe. Partially funds technical assessments and international agreements negotiation start-up costs associated with promising cooperative R&D programs. Funds preliminary and negotiation costs associated with USAF NATO cooperative R&D funded programs and support for the NATO AWACS Board of Directors.</p>	

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BUDGET ACTIVITY 6 - Management and Support	PE NUMBER AND TITLE 1001004F International Activities	PROJECT 4645
<p>– (U) \$1,545 AFMC - Fully funds Air Force Material Command activities to identify, assess, and develop support packages and project arrangements as required by statute for new and existing candidate agreements. Supports Materiel Command activities for the USAF Foreign Comparative Test, and NATO Cooperative R&D Programs. Funds USAF participation in panel meetings of the Technical Cooperation Program, Air standardization Coordinating Committee, Standard NATO Agreements Working Groups, and other NATO forums. Funds periodic bilateral meetings to define new areas of possible cooperation, funds exploratory visits to France, Germany, Israel, United Kingdom, Canada, and other countries on new technology exchange projects. Funds support for the Air force Technology Booth at International Forums. Funds the International Focal Point Officers at Centers and Laboratories to assist program officers and project engineers in identifying, creating and staffing new international cooperative agreements. Funds HQ staff to support and promote international research and development cooperation throughout AFMC. Funds small contracts in support of technology initiatives. Funds the support, management and documentation of these ICR&D efforts.</p> <p>– (U) \$3,752 Total</p>		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>		
	<u>FY 1998</u>	<u>FY 1999</u>
(U) Previous President's Budget	3,715	3,827
(U) Appropriated Value	3,715	
(U) Adjustments to Appropriated Value		
a. Congressional General Reductions	-121	
b. SBIR	-3	
c. Omnibus or other above reprogramming threshold		
d. Below threshold reprogramming		
(U) Adjustments to budget years since FY98 PB		-75
(U) Current Budget Submit/President's Budget	3,591	3,752
(U) Change Summary Explanation:		
Funding: N/A		
Schedule: N/A		
Technical: N/A		

DATE
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BUDGET ACTIVITY
6 - Management and Support

PE NUMBER AND TITLE
1001004F International Activities

(U) C. Other Program Funding

Related RDT&E:

(U) This program provides for USAF management oversight of the NATO Cooperative R&D funded by DoD (PE 603790D) and USAF (PE 603790F) and DoD funded Foreign Comparative Test (FCT) (PE 0605130D) programs. It also provides international agreement support for 6.1 through 6.3 programs for the Air Force Research Laboratory and for 6.4 through 6.5 programs for USAF Product and Logistics Centers.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE	
							February 1998	
BUDGET ACTIVITY				PE NUMBER AND TITLE				PROJECT
6 - Management and Support				1001004F International Activities				4645
(U) D. <u>Schedule Profile</u>								
		<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4
(U)								
-NATO C3 Agency Program Review				X				X
-NATO Research & Technology Board	X		X		X		X	
-Aerospace Applications Studies Committee	X	X	X					
-Bilateral Technology R&D Projects MOUs	X	X	X	X	X	X	X	X
-Cooperative R&D Projects	X	X	X	X	X	X	X	X
-Foreign Comparative Testing Prioritization Board		X				X		
-NATO Cooperative R&D Prioritization Board			X				X	
-R&D Loans of Defense Equipment	X	X	X	X	X	X	X	X
-Systems & Technology Forum (JA)	X		X		X		X	
-Other Bilateral forums (CA, BZ, IS, SW, FR)	X	X	X	X	X	X	X	X
-Data/Information Exchange Annexes	X	X	X	X	X	X	X	X
-Engineer and Scientist Exchanges	X	X	X	X	X	X	X	X
-NATO Air Force Armaments Group	X		X		X		X	
-Four-Power Air Senior National Representatives	X		X		X		X	
-Four-Power Long-Term Technology Working Group		X		X		X		X

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE

February 1998

BUDGET ACTIVITY

7 - Operational System Development

PE NUMBER AND TITLE

0101113F B-52 Squadrons

COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	10,594	3,235	6,436	2,733	0	0	33,727	0	TBD
4370 Advanced Weapons Integration (AWI)	0	2,340	3,691	0	0	0	33,727	0	TBD
4401 Air Force Mission Support System (AFMSS)	5,327	895	2,745	2,733	0	0	0	0	14,501
4402 Electronic Countermeasures Improvement (ECMI)	5,160	0	0	0	0	0	0	0	5,160
4493 B-61 Mod 11 Flight Tests	107	0	0	0	0	0	0	0	1,152
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: RDT&E articles are not separately priced.

(U) A. Mission Description and Budget Item Justification

The B-52 is the primary nuclear roled bomber in the USAF inventory. It provides the only Air Launch Cruise Missile carriage in the USAF. The B-52 also provides theater CINCs with a long range strike capability. The B-52 is undergoing a Conventional Enhancement Modification which allows it to carry MIL-STD 1760 weapons. The current service life of the aircraft extends to 2040. The Advanced Weapons Integration (AWI) program supports the conventional enhancement of the B-52 through the addition of the Wind Corrected Munitions Dispenser (WCMD), Joint Direct Attack Munition (JDAM), Joint Stand-off Weapon (JSOW), and the Joint Air-to-Surface Stand-off Missile (JASSM). The Air Force Mission Support System supports the Air Force movement of all mission planning to a common system. Electronic Countermeasures Improvement supports a DESERT STORM identified deficiency. The B-61 Mod 11 program was added at the direction of the Nuclear Posture Review and Presidential Decision Directive-30. The ALR-20A System Replacement replaces the current Electronic Countermeasures radio frequency receiver with modern equipment. The B-52's Avionics Midlife Improvement is a phased program to replace mission critical parts of the Offensive Avionics System that controls weapons delivery on the B-52. The B-52 program management is provided by Air Force Material Command's Oklahoma Air Logistics Center. The prime contractor for these projects is Boeing, McDonnell Defense in Wichita Kansas. This program is in budget activity 7 - Operational System Development, because it supports a currently operational system.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998PB)	10,612	3,427	3,765	TBD
(U) Appropriated Value	11,035	3,427		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-249	-112		
b. SBIR	-192	-80		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-18			
(U) Adjustments to Budget Years Since FY 1998 PB			2,671	
(U) Current Budget Submit/ FY1999 President's Budget	10,594	3,235	6,436	TBD

(U) Change Summary Explanation:
Funding: FY99 adds \$2.8M to AFMSS.

Schedule: None

Technical: None

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Aircraft Procurement (PE 11113F)	20,157	38,428	38,308	27,793	69,448	35,416	6,458	1,000	237,008
(U) Missile Procurement (PE 11113F)	1,766	0	0	0	0	0	0	n/a	3,768

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) WCMD/JDAM IOC									X			
(U) JSOW IOC												
(U) JASSM IOC												
(U) ECM Improvement IOC												
(U) B-61 Mod 11 Flight Test Completed				X								

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0101113F B-52 Squadrons				PROJECT 4370		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
4370 Advanced Weapons Integration (AWI)	0	2,340	3,691	0	0	0	33,727	0	TBD	
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	
<p>(U) <u>A. Mission Description and Budget Item Justification</u> The requirement exists for the integration of near precision and precision guided MIL-STD 1760 weapons on the B-52. This includes the Wind Corrected Munitions Dispenser (WCMD), Joint Direct Attack Munition (JDAM), Joint Stand-off Weapon (JSOW), and the Joint-Air-to-Surface Stand-off Missile (JASSM). The B-52 is designated as the threshold bomber test platform for WCMD, JDAM, and JASSM with the objective of meeting aircraft integration and weapon testing requirements. To provide complete understanding of the program and its funding, the following schedule information in section C will reflect the money received from the WCMD, JDAM, and JASSM program elements for weapons integration on the B-52.</p> <p>(U) <u>Acquisition Strategy</u> The AWI program placed Boeing, ISDS, Wichita, KS on a Cost-Plus-Fixed-Fee contract as the Product Development Organization supported by OC-ALC/LH. Due to the short notice requirement, interface development and initial software requirements definition is being accomplished under the B-52 fleet support contract; a time and materials contract. The first phase will be to support the Direct Attack Stores Management Overlay (SMO) Developmental Test and Evaluation (DT&E) and DT&E of hardware interface equipment. The Direct Attack SMO supports WCMD and JDAM. The second phase will support the DT&E of the Stand-off SMO. The Stand-off SMO supports JSOW and JASSM. Due to the need for rapid Required Assets Availability and Initial Operational Capability dates, the Single Acquisition and Management Plan directed concurrence for RDT&E of the Direct Attack SMO and the production hardware (MIL-STD 1760 umbilicals to transfer 1760 data from the weapons pylon to the weapon itself). Although production continues through development of the Stand-off SMO, development of the production materials is completed in FY 97. JSOW and JASSM will use the same umbilicals as WCMD and JDAM.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u> – (U) \$0 No activity</p> <p>(U) <u>FY 1998 (\$ in Thousands):</u> – (U) \$354 Initiate Software development for JSOW and JASSM – (U) \$125 Initiate Hardware development for JSOW and JASSM</p>										
Project 4370			Page 4 of 21 Pages			Exhibit R-2 (PE 0101113F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE		
		February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT		
7 - Operational System Development	0101113F B-52 Squadrons	4370		
<ul style="list-style-type: none"> - (U) \$1,861 Initiate Flight/Ground Testing - (U) \$2,340 Total (U) <u>FY 1999 (\$ in Thousands):</u> - (U) \$495 Continue Software development for JSOW and JASSM - (U) \$270 Continue Hardware development for JSOW and JASSM - (U) \$2,926 Flight/Ground Testing - (U) \$3,691 Total 				
 (U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998PB)	0	2,479	3,765	TBD
(U) Appropriated Value		2,479		
(U) Adjustments to Appropriated Value				
a. Cong Reductions		-81		
b. SBIR		-58		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1998 PB			-74	
(U) Current Budget Submit/FY 1999 President's Budget	0	2,340	3,691	TBD
 (U) Change Summary Explanation:				
Funding: None				
Schedule: None				
Technical: None				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons	PROJECT 4370
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Aircraft Procurement (PE 11113F)	4,119	8,740	4,058	1,000	0	0	0	0	17,917

(U) Related Activities

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) RDT&E (WCMD - PE 27600F)	5,725	1,600	0	0	0	0	0	0	13,225
(U) RDT&E (JDAM - PE 27583F)	3,456	6,400	0	0	0	0	0	0	14,358
(U) RDT&E (JASSM - PE 27160F)	7,000	8,000	2,900	2,000	0	0	0	0	21,400

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0101113F B-52 Squadrons						PROJECT 4370	
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) JDAM/WCMD SMO												
(U) Contractor interface development	X		X									
(U) Software/hardware Req DT&E	X						X					
(U) Test Planning	X						X					
(U) Technical data development	X						X					
(U) Ground/flight testing			X				X					
(U) AFMSS module DT&E	X						X					
(U) Program office support	X						X					
(U) Stand-off SMO												
(U) Contractor Interface Development	X											
(U) Software/hardware Req DT&E	X											
(U) Test planning	X											
(U) Technical data development												X
(U) Ground/flight testing												X
(U) AFMSS module DT&E												X
(U) Program support office	X											X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0101113F B-52 Squadrons			PROJECT 4370		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Software/hardware requirements				0	2,340	3,691			
(U)	Total				0	2,340	3,691			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Boeing, ISDS, Wichita, KS 88CG/SCCVO OC-ALC/LH	CPFF	4 Sep 97	3,702	0	2,608	0	404	690	0	TBD
	Project Order	13 Mar 96	2	0	2	0	0	0	0	2
	PMA	1 Oct 96	322	0	172	0	75	75	0	322
<u>Support and Management Organizations</u>										
OC-ALC/LAS	Project Order	16 Jul 97	750	0	750	0	0	0	0	750
AEDC/DOF	Project Order	3 Jun 97	48	0	48	0	0	0	0	48
<u>Test and Evaluation Organizations</u>										
419 FLTS	Project Order	31 Jan 96	5,152	0	152	0	1,861	2,926	0	TBD
49 Tests	AF Form 616	31 Aug 96	10	0	10	0	0	0	0	10
Government Furnished Property: None										
Project 4370					Page 8 of 21 Pages			Exhibit R-3 (PE 0101113F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0101113F B-52 Squadrons					PROJECT 4370
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development			4,026	0	2,782	0	479	765	0	TBD
Subtotal Support & Management			798	0	798	0	0	0	0	798
Subtotal Test and Evaluation			5,162	0	162	0	1,861	2,926	0	TBD
Total Project			9,986	0	3,742	0	2,340	3,691	0	TBD

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons	PROJECT 4401
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4401 Air Force Mission Support System (AFMSS)	5,327	895	2,745	2,733	0	0	0	0	14,501
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Air Force Mission Support System (AFMSS) previously funded out of the AFMSS program element. Develops an aircraft specific avionics/weapons/electronic countermeasures (A/W/E) module to be used in conjunction with core AFMSS. AFMSS is the replacement mission planning system for the current B-52 Mission Data Preparation System. AFMSS will provide future ground/inflight mission planning capability. Block 1 provides the capability to plan conventional gravity missions at the unit level. Block 2 provides the capability to plan JDAM and WCMD missions, accomplish Periodic Depot Maintenance (PDM) on the B-52 test aircraft (050). It also establishes the capability to import TRICOMS mission data into AFMSS. Block 3 of this project will adds planning capability for AGM-142, AGM-84, AGM-86C, and IU/TACAN. Block 4 provides JSOW and JASSM capabilities. Block 5 enables migration from the current AFMSS core architecture to the planned new architecture.

(U) Aquisition Strategy

The AFMSS program is organically conducted at OC-ALC/LAS. Previously funded by the AFMSS program element.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,079 Initiate Block 2 operational software for WCMD and JDAM
- (U) \$3,053 Complete periodic depot maintenance for the B-52 test aircraft
- (U) \$195 Establish TRICOMS import capability
- (U) \$5,327 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$615 Initiate Block 3 operational software for AGM-142, AGM-86C, AGM-84, IU/TACAN and for other advanced weapons, as required
- (U) \$280 Complete Block 2 operational software
- (U) \$895 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$700 Initiate Block 4 operational requirements for JSOW and JASSM and other advanced weapons as required.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons	PROJECT 4401		
- (U) \$2,045 Complete Block 3 operational software - (U) \$2,745 Total				
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998PB)	5,200	948		14,501
(U) Appropriated Value	5,507	948		
(U) Adjustments to Appropriated Value				
a. Cong Reductions		-31		
b. SBIR	-180	-22		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1998 PB			2,745	
(U) Current Budget Submit/FY 1999 President's Budget	5,327	895	2,745	14,501
(U) Change Summary Explanation:				
Funding: Funding added to FY99 and FY00 to complete Blocks 4 and 5. Air Combat Command added requirement for all non-1760 as well as 1760 weapons to have AFMSS mission planning capability.				
Schedule: None				
Technical: None				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> - not applicable				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons	PROJECT 4401
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(U) D. Schedule Profile

The B-52 peculiar mission planning software development is accomplished and delivered incrementally. Each work package within a block build is treated as a mini-development with its own analysis, design, and test. The work package are integrated with one another and with the AFMSS core.

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract award Block 2												
(U) Software development Block 2	X				X							
(U) Contract award Block 3				X								
(U) Software development Block 3					X			X				
(U) Test aircraft PDM	X											
(U) Contract award Block 4									X			
(U) Software development Block 4									X			X
(U) Contract award Block 5												
(U) Software development Block 5												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons	PROJECT 4401
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Software development	1,516	832	2,695
(U) System Program Office support	758	63	50
(U) OC-ALC/LH Program Depot Maintenance	3,053	0	0
(U) Total	5,327	895	2,745

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons	PROJECT 4401
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Oklahoma ALC/LAS	Project Order	26 Mar 97	11,075	0	2,701	2,079	842	2,645	2,633	10,900
<u>Support and Management Organizations</u>										
OC-ALC/LH	Project order	Oct 97	0	453	100	100	53	100	100	453
OC-ALC/LAP	Project order	Jun 97	3,053	0	0	3,053	0	0	0	3,053
<u>Test and Evaluation Organizations</u>										
419 th	DT&E	11 Dec 96	95	0	0	95	0	0	0	95
Government Furnished Property: None										
Subtotal Product Development			11,075	0	2,701	2,079	842	2,645	2,633	10,900
Subtotal Support & Management			3,053	453	100	3,153	53	100	100	3,506
Subtotal Test and Evaluation			95	0	0	95	0	0	0	95
Total Project			14,223	453	2,801	5,327	895	2,745	2,733	14,501

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons	PROJECT 4402
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4402 Electronic Countermeasures Improvement (ECMI)	5,160	0	0	0	0	0	0	0	5,160

Quantity of RDT&E Articles	1	0	0	0	0	0	0	0	1
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Note: Articles are not separately priced.

(U) A. Mission Description and Budget Item Justification

The electronic countermeasures of the B-52 ALQ-172 ECM suite must be improved to cover a requirement identified during DESERT STORM. The improvement provides for an increased memory capability to handle advanced threats as well as correcting a coverage capability problem. The project adds a third ALQ-172 to the ECM suite and develops the new display required by the addition of the third system. The modification also improves two common core Line-Replaceable-Units. Normal circuit cards are replaced with circuit cards holding erasable PROMs and gate array modules. Memory is increased 400% and Mean-Time-Between-Failure is increased.

(U) Acquisition Strategy

The ECM Improvement program placed Boeing, McDonnell Wichita, KS and ITT Avionics Nutley, NJ on Firm-Fixed-Price contracts as Product Development Organizations. Boeing, McDonnell provides the aircraft specific integration expertise, while ITT provides expertise on the ALQ-172 system. They are supported by OC-ALC/LH and WR-ALC/LNR.

(U) FY 1997 (\$ in Thousands):

- (U) \$150 System Requirement Review
- (U) \$433 Fabrication of lab mock-up
- (U) \$4,577 Developmental kit fabrication
- (U) \$5,160 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 No activity

(U) FY 1999 (\$ in Thousands):

- (U) \$0 No activity

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0101113F B-52 Squadrons			PROJECT 4402					
(U) B. <u>Program Change Summary (\$ in Thousands)</u>												
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>						
						<u>Cost</u>						
(U) Previous President's Budget (FY 1998 PB)		4,818	0	0		5,160						
(U) Appropriated Value		5,071										
(U) Adjustments to Appropriated Value												
a. Cong Reductions		-150										
b. SBIR												
c. Omnibus or Other Above Threshold Reprogram												
d. Below Threshold Reprogramming		-239										
(U) Adjustments to Budget Years Since FY 1997 PB												
(U) Current Budget Submit/ FY 1999 President's Budget		5,160	0	0		5,160						
 (U) Change Summary Explanation:												
Funding: \$150,000 reduction to pay Congressional bills. \$239,000 added from internal Air Force reprogramming.												
Schedule: None												
Technical: None												
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>												
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>		
									<u>Compl</u>	<u>Cost</u>		
(U) Aircraft Procurement (PE 11113F)		0	4,749	5,013	17,139	49,213	35,575	6,778	200	118,667		
 (U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>						
(U) Contract award	1	2	3	4	1	2	3	4	1	2	3	4
(U) Kit proof	X											
(U) System Requirement Review				X								
Project 4402		Page 16 of 21 Pages					Exhibit R-2 (PE 0101113F)					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0101113F B-52 Squadrons			PROJECT 4402		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	System Requirement Review				150	0	0			
(U)	Mock-up fabrication				300	0	0			
(U)	Developmental kit proof				4,577	0	0			
(U)	System Program Office support				133	0	0			
(U)	Total				5,160	0	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Boeing Wichita,	FFP	Oct 96	5,027	0	0	5,027	0	0	0	5,027
ITT Avionics										
<u>Support and Management Organizations</u>										
OC-ALC/LH	PMA	Oct 96	0	84	0	84	0	0	0	84
HQ ACC/LGF52	AF Form 616	03 Dec 96	25	0	0	25	0	0	0	25
WR-ALC/LNRB	AF Form 616	03 Dec 96	20	0	0	20	0	0	0	20
HQ ACC/DOIE	AF Form 616	18 Nov 96	4	0	0	4	0	0	0	4
<u>Test and Evaluation Organizations</u>										
n/a										
Government Furnished Property: None										
Project 4402					Page 17 of 21 Pages			Exhibit R-3 (PE 0101113F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0101113F B-52 Squadrons				PROJECT 4402	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Subtotal Product Development			5,027	0	0	5,027	0	0	0	5,027
Subtotal Support & Management			49	84	0	133	0	0	0	133
Subtotal Test and Evaluation			0	0	0	0	0	0	0	0
Total Project			5,076	84	0	5,160	0	0	0	5,160

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons	PROJECT 4493
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4493 B-61 Mod 11 Flight Tests	107	0	0	0	0	0	0	0	1,152
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification
 The program involves development and testing of a modified nuclear weapon on B-52 operational aircraft. Replacement of a strategic weapon was recommended by the Nuclear Posture Review and directed by Presidential Decision Review-30. Congress was notified during the second quarter of FY 1995, of the Department of Defense, and the Department of Energy intent to modify an existing weapon to provide a replacement option. Modifications (made by the Department of Energy) to the B-61 Mod 7 strategic bomb accomplish the mission requirements of the replaced weapon. Modification of an existing weapon is less expensive than the cost to develop a new weapon from "scratch." Flight testing by the 419th FLTS, Edwards AFB, CA is required to certify the modified weapon mass and physic properties are the same as the Mod 7 device.

(U) Acquisition Strategy
 The Department of Energy is organically conducting the modifications to the B-61 Mod 11 weapon.

- (U) FY 1997 (\$ in Thousands):
- (U) \$ 107 Complete data analysis and develop new ballistics tables for aircraft operational delivery.
 - (U) \$ 107 Total

- (U) FY 1998 (\$ in Thousands):
- (U) \$0 No activity

- (U) FY 1999 (\$ in Thousands):
- (U) \$0 No activity

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BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0101113F B-52 Squadrons

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101113F B-52 Squadrons	PROJECT 4493							
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget (FY 1998PB)	594	0	0	1,152					
(U) Appropriated Value	594								
(U) Adjustments to Appropriated Value									
a. Cong Reductions	-487								
b. SBIR									
c. Omnibus or Other Above Threshold Reprogram									
d. Below Threshold Reprogramming									
(U) Adjustments to Budget Years Since FY 1998PB									
(U) Current Budget Submit/ FY 1999 President's Budget	107	0	0	1,152					
 (U) Change Summary Explanation:									
Funding: Reduction in FY97 due to Congressional bills levied against the B-52.									
Schedule: None									
Technical: None									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> Not applicable									
 (U) D. <u>Schedule Profile</u>									
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>			
		1	2	3	4	1	2	3	4
(U) Major Assembly Release test	X								
(U) Aeroballistic/Dispersion tests		X		X					
(U) DOE modification program		X		X					
Project 4493									
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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0101113F B-52 Squadrons				PROJECT 4493		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) System Program Office support					107	0	0			
(U) Total					107	0	0			
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
SA-ALC/NWI	Project Order	25 Jun 97	280	0	280	0	0	0	0	280
SA-ALC/NWI	AF Form 616	10 Feb 97	107	0	0	107	0	0	0	107
SAF/FMBMB	MIPR	28 Jan 97	765	0	765	0	0	0	0	765
<u>Support and Management Organizations</u>										
n/a										
<u>Test and Evaluation Organizations</u>										
n/a										
Government Furnished Property: None										
Subtotal Product Development			1,152	0	1,045	107	0	0	0	1,152
Subtotal Support & Management			0	0	0	0	0	0	0	0
Subtotal Test and Evaluation			0	0	0	0	0	0	0	0
Total Project			1,152	0	1,045	107	0	0	0	1,152
Project 4493				Page 21 of 21 Pages				Exhibit R-3 (PE 0101113F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101120F Advanced Cruise Missile	PROJECT 3844
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3844 (U) Advanced Cruise Missile	1,105	2,314	0	0	0	0	0	0	3,419
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The Advanced Cruise Missile (ACM) is a low-observable, air-launched, strategic missile with significant improvements over the Air Launched Cruise Missile B version (ALCM-B) in range, accuracy, and survivability. Armed with a W80 warhead, it is designed to evade air and ground-based defenses in order to strike heavily defended, hardened targets at any location within any enemy's territory. The ACM is designed for B-52H external carriage. Missile procurement is complete. FY 97 and FY98 funds are required to complete depot development work. This program is in budget activity 7, Operational System Development, because the program effort involves depot development.

(U) Acquisition Strategy: To complete the acquisition of the AGM-129A (ACM), two programs were required at the depot. In 1997 the capability to repair software will be completed. Final step involves setting up a maintenance and surveillance capability for nuclear aging and hardness at the depot. These funds will be obligated in the 3rd quarter of FY98.

(U) FY 1997 (\$ in Thousands):

- (U) \$1,105 Complete Development of Software Repair Capabilities at Depot
- (U) \$1,105 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$2,314 Develop Aging and Hardness Maintenance/Surveillance Capabilities at Depot
- (U) \$2,314 Total

(U) FY 1998 SBIR Reduction (\$79,000)

- (U) \$36,000 Sec 8043 (1.5)
- (U) \$30,000 Sec 8048 (NMD)
- (U) \$13,000 Econ Assumption

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101120F Advanced Cruise Missile	PROJECT 3844
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(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	1,107	2,393	0	3,500
(U) Appropriated Value	1,165			
(U) Adjustments to Appropriated Value				
a. Congressional General Reductions	(30)			
b. SBIR	(30)	(79)		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	(2)			
(U) Adjustments to Budget Years Since FY 97 PB				
(U) Current Budget Submit/98PB	1,105	2,314*		3,419

(U) Change Summary Explanation:

Funding: None
Schedule: None
Technical: None

(U) * Note: \$15M on withhold pending reprogramming for higher priorities

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101120F Advanced Cruise Missile	PROJECT 3844
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(U) C. Other Program Funding Summary (\$ in Thousands)
 ACM is a fielded weapon system. Procurement funds are for program management activities related to the on-going purchase of flight test instrumentation kits (TIKs) and FOT&E mission support. Flight TIKs are used to evaluate ACM operational availability and air vehicle reliability. O&M funding provides for support activities to maintain ACM for USSTRATCOM.

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Weapon Procurement (3020)									
(U) Budget Activity									
(U) 2. Other Missiles	771	843	1,422	1,464	1,391	1,431	1,470	0	8,792
(U) 4. Replenishment Spares	241	465	0	0	0	0	0	0	706
(U) Operations and Maintenance (3400)	13,166	18,591	14,936	14,879	12,996	13,087	13,812	0	101,467
(U) Related RDT&E (3600): None									

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract Milestones												
(U) NONE												
(U) Other Program Events												
(U) Depot Activation/Completion				X								
(U) Aging and Surveillance Programs					X							

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3) DATE **February 1998**

BUDGET ACTIVITY **7 - Operational System Development** PE NUMBER AND TITLE **0101120F Advanced Cruise Missile** PROJECT **3844**

(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Depot Activation			
(U) Sensor Depot Test/Repair	165	0	0
(U) Software Compiler Rehost	940	0	0
(U) Surveillance	0	2,314	0
(U) Total	1,105	2,314	0

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101120F Advanced Cruise Missile	PROJECT 3844
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

(U) Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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(U) Product Development Organizations

Hughes MSC										
Tucson, AZ	SS/FPIF	May 92	16,914	16,914	15,946	0	0	0	0	15,946
Kearfott										
Wayne, NJ	SS/FFP	Aug 93	8,077	8,077	6,200	0	0	0	0	6,200
Rockwell										
Newark, OH	SS/CPAF	Jul 96								
OC-ALC	PO	Oct 94/ Dec 96			3,135	1,105	0	0	0	4,240
	Contract	Apr 98			0	0	2,314	0	0	2,314

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0101120F Advanced Cruise Missile	PROJECT 3844
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(U) Support and Management Organizations: Not Applicable

(U) Test and Evaluation Organizations : Not Applicable

(U) **Government Furnished Property**: Not Applicable

	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
(U) Subtotal Product Development	35,574	1,105	2,314	0	0	38,993
(U) Subtotal Support and Management	5,707	0	0	0	0	5,707
(U) Subtotal Test and Evaluation	0	0	0	0	0	0
(U) Total Project	41,281	1,105	2,314	0	0	44,700

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0102325F Joint Surveillance System	PROJECT 2996
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2996 FAA/AF Radar Replacement (FARR)	3,654	1,831	2,175	0	0	0	0	0	23,582
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program is in budget activity 7 - Operational System Development because it provides funding for the modernization of a currently existing and operating system. The Joint Surveillance System (JSS) provides command, control and communications (C3) capability in support of CINC NORAD's (North American Aerospace Defense) Atmospheric Tactical Warning and Attack Assessment (ATW/AA) air sovereignty, and air defense requirements. The JSS Connectivity (JSS-C) program provides improvements to this capability by integrating new sensor data and enhancing communications capabilities via the Advanced Interface Control Unit (AICU). The FAA/Air Force Radar Replacement (FARR) program will replace 40 existing JSS radars with solid-state, three-dimensional ARSR-4 radars to improve mission performance and reduce operation and maintenance costs. The JSS-C portion of this PE falls under Budget Activity 7, research category 6.6, Operational System Development, as it is a system being deployed to the operational community to solve an operational deficiency in the existing operational system and is post Milestone Three. The FARR portion of this program element also falls under Budget Activity 7, Operational System Development, as it has received approval for production. The Region and Sector Air Operations Center (R/SAOC) Modernization program will provide a modernized C4I system with enhanced capability to integrate data from existing and future civil and military defense surveillance systems into a comprehensive recognized air picture to enhance CINC NORAD's capability to conduct peacetime air sovereignty, transition and conventional warfare in the event of aggression toward the North American Continent. The current system has reached saturation in its capability to receive, process, display, exchange, and employ air surveillance data from current sensor systems. In some cases, it has exceeded processing and displaying capacity, thus contributing to delayed C4I decisions. The outdated technology has become increasingly difficult and costly to maintain.

(U) Acquisition Strategy:

Management of the JSS Connectivity is by the Electronic Systems Center, Air Force Materiel Command, Hanscom AFB, MA. The prime contractor for the AICU is TRW, Aurora, CO. Enhanced Traffic Management System (ETMS), Department of Transportation, Cambridge, MA provides the AICU with flight plan information from FAA sources. The Federal Aviation Administration (FAA) is the lead acquisition agency for the FAA/AF Radar Replacement Program in accordance with a 19 November 1984 sub-agreement (as amended by Amendment 1, dated 1 September 1988) to FAA/AF National Agreement (NAT) 711. The FAA and the Air Force have established a joint Program Office at HQ, FAA, Washington, DC for this procurement. Northrup Grumman Corporation, Linthicum, MD is the prime contractor for the FARR program.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0102325F Joint Surveillance System	2996
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$427 Provided program office support - (U) \$844 Continued test support for FARR Joint Program Office (JPO) - (U) \$832 Continued radar production, installation, test, and system checkout - (U) \$1,551 Provided interoperability evaluations and commissioning support - (U) \$3,654 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$295 Provide program office support - (U) \$51 Continue test support for FARR Joint Program Office (JPO) - (U) \$785 Continue installation, test and system checkout - (U) \$700 Continue interoperability evaluations and commissioning support - (U) \$1,831 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$311 Provide program office support - (U) \$1,424 Continue test and system checkout - (U) \$440 Continue interoperability evaluations and commissioning support - (U) \$2,175 Total 		
Project 2996	Page 2 of 6 Pages	Exhibit R-2 (PE 0102325F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0102325F Joint Surveillance System	PROJECT 2996
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement AF, WSC 86190A	0	849	639	0	0	0	0	TBD	TBD

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) FARR last operational readiness date									x			
(U) FARR follow-on support including baselining/commissioning before FAA final acceptance					x							x

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0102325F Joint Surveillance System				PROJECT 2996	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Systems engineering				596	700	440			
(U)	Contractor engineering support				858	140	144			
(U)	Installation/Test/Checkouts				1773	696	1280			
(U)	Program Office support				427	295	311			
(U)	Total				3,654	1,831	2,175			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
None					0	0	0	0	0	0
<u>Support and Management Organizations</u>										
MITRE	Various		N/A	N/A	3,803	596	700	400	0	5,539
TEMS	Various		N/A	N/A	1,669			144	0	1,813
Martin Marietta	Various		N/A	N/A	5,341	858	140		0	6,339
Project 2996					Page 5 of 6 Pages			Exhibit R-3 (PE 0102325F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE
7 - Operational System Development										February 1998
BUDGET ACTIVITY					PE NUMBER AND TITLE					PROJECT
7 - Operational System Development					0102325F Joint Surveillance System					2996
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Program Office Support	Various		N/A	N/A	1,087	427	295	311	0	7,771
<u>Test and Evaluation Organizations</u>										
Various					4,022	1,773	696	1,280	0	7,771
Government Furnished Property: None										
Subtotal Product Development					0	0	0	0	0	0
Subtotal Support and Management					11,900	1,881	1,135	895	0	15,811
Subtotal Test and Evaluation					4,022	1,773	696	1,280	0	7,771
Total Project					15,922	3,654	1,831	2,175	0	23,582

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0102326F Region/Sector Operations Control Center Modernization Program	PROJECT 4592
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4592 Region/Sector Operations Modernization Center (R/SAOC)*	8,921*	19,233	13,592	8,739	3,811	5,818	5,866	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* Funds have been realigned from PE 0102325F to PE 0102326F. All dollars previously reported in PE 0102325F for Projects 2976 and 4559 were reclassified to PE 0102326F in FY98. FY 98 and outyear funds have been budgeted in PE 0102326F.

(U) A. Mission Description and Budget Item Justification

The Region and Sector Air Operations Center (R/SAOC) Modernization program will provide a modernized C4I system with enhanced capability to integrate data from existing and future civil and military defense surveillance systems into a comprehensive recognized air picture to enhance CINC NORADS's (North American Aerospace Defense Command) capability to conduct peacetime air sovereignty, transition and conventional warfare in the event of aggression toward the North American Continent. The current system has reached saturation in its capability to receive, process, display, exchange, and employ air surveillance data from current sensor systems. In some cases, it has exceeded processing and displaying capacity, thus contributing to delayed C4I decisions. The outdated technology has become increasingly difficult and costly to maintain. This program is in budget activity 7 - Operational System Development because it provides funding for the modernization of a currently existing and operating system.

(U) Acquisition Strategy:

Management for the R/SAOC Modernization is by ESC, AFMC, Hanscom AFB MA. The R/SAOC Modernization acquisition is being refined in preparation of the MS II decision. Prime Contract was awarded in March 1997 to Litton Data Systems Division, Agoura Hills, CA.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0102326F Region/Sector Operations Control Center Modernization Program	4592
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$5,969 Updated hardware and software in the US/Canadian Air Defense C2 Centers - (U) \$1,118 Systems Engineering Support - (U) \$1,452 Program Management and Technical Support - (U) \$ 382 Program Office Support - (U) \$8,921 Total* <p>* 1415-3 reclassification of appropriated funds from PE 0102325F (Joint Surveillance System) to PE 0102326F.</p> <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$15,207 Continuation of Prime Contract - (U) \$1,560 Systems Engineering Support - (U) \$2,035 Program Management and Technical Support - (U) \$ 431 Program Office Support - (U) \$19,233 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$9,062 Continuation of "Core" Software Development/Modification for COC and Prepare for Install of New Equipment at First Site - (U) \$1,589 Systems Engineering Support - (U) \$1,958 Program Management and Technical Support - (U) \$ 983 Program Office Support - (U) \$13,592 Total 		
Project 4592	Page 2 of 5 Pages	Exhibit R-2 (PE 0102326F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0102326F Region/Sector Operations Control Center Modernization Program			PROJECT 4592			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>				
						<u>Cost</u>				
(U) Previous President's Budget		0	20,512	14,065		TBD				
(U) Appropriated Value		0	20,512			TBD				
(U) Adjustments to Appropriated Value										
a. Cong /General Reductions		-276	-872							
b. SBIR		-163	-407							
c. Omnibus or Other Above Threshold Reprogram		9,479*								
d. Below Threshold Reprogramming		-104								
e. Rescissions		-15								
(U) Adjustments to Budget Years Since FY 1998 PB				-473						
(U) Current Budget Submit/FY1999 President's Budget		8,921	19,233	13,592		TBD				
(U) Change Summary Explanation:										
Funding: FY97 -\$25 for App Act Sec 8037(H), -\$54 for Sec 8037(E), -\$188 for Sec 8136, -\$9 for Sec 8138.										
*\$9,479 Approved by OUSD(C) on 4 Feb 97 (FY 97-21 IR). 1415-3 reclassification of appropriated funds from PE 0102325F to PE 0102326F. All funding previously reported in PE 0102325F for Projects 2976 and 4559) were reclassified to PE 0102326F in FY98. Consequently, all adjustments were also reallocated to PE 0102326F based on the reclassified amounts and are reflected in this R-2 submission. FY 98 and outyear funds have been budgeted in PE 0102326F.										
Funding: FY98 -\$82 for Sec 8035, -\$120 for Sec 8041, -\$307 for Sec 8043, -\$256 for Sec 8048, -\$107 for Economic Assumptions										
Schedule: R/SAOC contractor announced schedule growth and corresponding cost growth due to his underestimation of effort and staffing problems. The schedule was extended 8 months and resultant cost growth is estimated at \$15 million.										
Technical: None										
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>		
									<u>To</u>	
									<u>Compl</u>	
(U) Other Procurement AF, WSC 834340, BA 7, P-1 55		0	0	11,137	4,713	1,916	4,831	5,037	Cont	<u>Total</u> TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0102326F Region/Sector Operations Control Center Modernization Program	PROJECT 4592

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) R/SAOC ORDII approved	x											
(U) R/SAOC RFP released	x											
(U) R/SAOC Mod Milestone II				x								
(U) R/SAOC Mod Contract Award		x										
(U) Site 1 (SEADS) Hardware & COTS Software Procurement					x							
(U) Procure Operator Work Stations						x				x		x
(U) COC Site Turnover												x
(U) Site 1 IOT&E												x

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0102326F Region/Sector Operations Control Center Modernization Program				PROJECT 4592	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	System Engineering Support				1,118	1,560	1,589			
(U)	Program Office Support				382	431	983			
(U)	Program Management and Technical Support				1,452	2,035	1,958			
(U)	Development/Modification of Software for COC				5,969	15,207	9,062			
(U)	Total				8,921	19,233	13,592			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
LITTON	CPAF	14 Mar 97	(R/SAOC)		0	5,969	15,207	9,062	Cont	TBD
<u>Support and Management Organizations</u>										
MITRE	Various		N/A	N/A	0	1,118	1,560	1,589	Cont	TBD
TEMS	Various		N/A	N/A	0	1,452	1,098	1,808	Cont	TBD
Program Office Support	Various		N/A	N/A		382	568	983	Cont	
<u>Test and Evaluation Organizations</u>										
46 th Test Wing /Other Test Activities							100	150	Cont	TBD
Government Furnished Equipment							700	0		
Subtotal Product Development					0	5,969	15,207	9,062	Cont	TBD
Subtotal Support and Management					0	2,952	3,226	4,380	Cont	TBD
Subtotal Test and Evaluation					0	0	800	150	Cont	TBD
Total Project					0	8,921	19,233	13,592	Cont	TBD
Project 4592					Page 5 of 5 Pages			Exhibit R-3 (PE 0102326F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0102411F North Atlantic Defense System (NADS)	PROJECT 2980
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2980 North Atlantic Defense System (NADS)	4,954	1,257	615	0	0	0	0	0	60,970
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program provides improvements to command, control, and communications (C3) and air surveillance capabilities in Iceland. The Control Reporting Center (CRC) and air surveillance radars support air defense requirements in the strategically important Greenland-Iceland-Norwegian gap. The program is a joint program with NATO funding infrastructure while the US funds cryptographic capabilities, system engineering and integration activities. The program is in budget activity 7 since it supports improvements to these currently operational systems.

(U) Acquisition Strategy: The acquisition of hardware has been completed. Current funding provides engineering support during the NATO Operational Review known as the JFAI (Joint Formal Acceptance Inspection). The JFAI is a NATO technical and financial audit. Any discrepancies must be corrected to satisfy NATO. This requires engineering and technical support to perform this function. NATO also requires On-Island Support to provide technical, management, logistics, and system support services. NATO is presently deliberating on the funding of Link 16 requirement for NADS. If NATO provides the infrastructure funding for Link 16, the US will fund system engineering and integration activities.

(U) FY 1997 (\$ in Thousands)

- (U) 2,018 Provided program office support
- (U) 2,723 Provided systems engineering support for NADS
- (U) 213 Completed support for Developmental Test and Evaluation (DT&E) and Operational Test & Evaluation (OT&E).
- (U) 4,954 Total

(U) FY 1998 (\$ in Thousands)

- (U) 537 Provide program office support
- (U) 720 Provide systems engineering support for NADS
- (U) 1,257 Total

NOTE: Program is nearing completion requiring only engineering support and program management.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0102411F North Atlantic Defense System (NADS)	PROJECT 2980		
<p>(U) <u>FY 1999</u> (\$ in Thousands)</p> <ul style="list-style-type: none"> - (U) 195 Provide program office support - (U) 420 Provide systems engineering support for NADS - (U) 615 Total <p>NOTE: Program is nearing completion requiring only engineering support and program management</p>				
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	4,962	1,442	0	60,548
(U) Appropriated Value	5,278	1,442		
(U) Adjustments to Appropriated Value				
a. Congressional General Reduction	-233	-183		
b. Below Threshold Reprogramming				
c. SBIR reduction	-83	-2		
d. Rescissions	-8			
(U) Adjustment to Budget Years			615	
(U) Current Budget Submit/FY1999 President's Budget	4,954	1,257	615	60,970
 (U) Change Summary Explanation:				
Funding:				
FY97 -\$27 for Appr Act Sec 8037(H), -\$95 for Section 8037(E), -\$106 for Section 8136 and -\$5 for Section 8138.				
FY98 -\$55 for Appr Act Sec 8035, -\$81 for Section 8041, -\$22 for Section 8043, -\$18 for Section 8048, -\$7 for Economic Assumptions.				
FY99 +615 added to complete on-island support and complete NATO Financial Audit				
 Schedule: FY1999 funding provided for program office support to accomplish the NATO Financial Audit and any residual clean-up taskings as a result of deficit findings of the Joint Formal Acceptance Inspection (JFAI).				
 Technical: None				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
Not Applicable				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0102411F North Atlantic Defense System (NADS)	PROJECT 2980
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) On-Site Development Test & Evaluation			x									
(U) Functional Configuration Audit (FCA)/Physical CA			x									
(U) System Operational Test & Evaluation				x								
(U) FOC*						x						
(U) Preparation for JFAI**					x				x			
(U) CI-13 Install**							x					
(U) JFAI***									x			
(U) NATO Financial Audit***										x		
(U) Program residuals and T&E										x	x	

*Air Combat Command accepted operational system 4QFY97. Correction of OT&E residuals will complete FOC scheduled for 2QFY98.
 **Schedule updates reflect the separation of "Preparation for JFAI" and "CI-13 Install" requirements, which were previously listed together.
 ***The addition of "JFAI" and "NATO Financial Audit", which were erroneously omitted on previous reports, and a more accurate estimate of the time necessary to complete residuals.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0102411F North Atlantic Defense System (NADS)				PROJECT 2980	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Engineering Support					2,723	720	420			
(U) Test and Evaluation Support					213	0	0			
(U) Program Support					2,018	537	195			
(U) Total					4,954	1,257	615			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
<u>Support and Management Organizations</u>										
MITRE	Various	Oct 94	N/A	N/A	33,954	2,723	420	720	0	37,817
TEMS	Various	Jun 94	N/A	N/A	14,715	1,147	400	100	0	16,362
Program Office Support	Various		N/A	N/A	2,310	871	137	95	0	3,413
<u>Test and Evaluation Organizations</u>										
Various					3,165	213	0	0	0	3,378
GFP/GFE:	None									
Subtotal Product Support					0	0	0	0	0	0
Subtotal Support and Management					50,979	4,741	1,257	615	0	57,592
Subtotal Test and Evaluation					3,165	213	0	0	0	3,378
<u>Total Project</u>					54,144	4,954	1,257	615	0	60,970
Project 2980					Page 4 of 4 Pages			Exhibit R-3 (PE 0102411F)		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207131F A-10 Squadrons	PROJECT 3861
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3861 A-10 Squadrons	0	0	3,212	6,956	6,761	3,119	10,511	TBD	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	TBD	TBD

(U) A. Mission Description and Budget Item Justification

The A-10 aircraft is the Air Force's dedicated Close Air Support (CAS) aircraft for support of ground maneuver forces. There is a need to upgrade and modernize the A/OA-10 aircraft to enhance its ability to support CAS and interdiction mission requirements. The Low Altitude Safety and Targeting Enhancement (LASTE) computer upgrade will enhance the computer memory, throughput, and system architecture to allow the aircraft to integrate advanced weapons and accommodate a situational awareness display, a data-link capability, an Electronic Warfare Management System, and the Digital Terrain System. This program is in budget activity 7 - Operational System Development because it supports an operational system.

(U) Acquisition Strategy:

The LASTE development will be conducted under the A-10 Prime Contract scheduled to be awarded in March 1998 on a full-and-open basis.

(U) FY 1997 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1999 (\$ in Thousands):

– (U) \$2,312 LASTE Computer Upgrade

– (U) \$2,358 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998						
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207131F A-10 Squadrons			PROJECT 3861						
(U) B. <u>Program Change Summary (\$ in Thousands)</u>													
			<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>						
							<u>Cost</u>						
(U) Previous President's Budget			0	0	2,312		TBD						
(U) Adjustments to Budget Years Since FY 1998 PB			0	0	0								
(U) Current Budget Submit/ FY 1999 President's Budget			0	0	2,312		TBD						
(U) Change Summary Explanation:													
Funding: None													
Schedule: None													
Technical: None													
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>													
			<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>		
										<u>Compl</u>	<u>Cost</u>		
(U) Aircraft Procurement, BP-11 (PE 27131F)			29,613	24,412	31,088	25,365	52,269	24,783	26,398	TBD	TBD		
(U) BP-29 (PE 207442F)			0	2,500	8,200	6,400	4,900	2,400	0	TBD	24,400		
(U) D. <u>Schedule Profile</u>													
			<u>FY 1997</u>		<u>FY 1998</u>			<u>FY 1999</u>					
(U) Low Altitude Safety and Targeting Enhancement (LASTE) computer upgrade RDT&E	1		2	3	4	1	2	3	4	1	2	3	4
										X			
Project 3861			Page 2 of 3 Pages				Exhibit R-2 (PE 0207131F)						

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207131F A-10 Squadrons				PROJECT 3861		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) LASTE					0	0	2,312			
(U) Total					0	0	2,312			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
LASTE		TBD	TBD							
Lockheed Martin	A-10 Prime	1Q99			0	0	0	2,312	8,100	10,412
Federal Systems	Contract/ CPAF									
<u>Support and Management Organizations</u>										
Not Applicable										
<u>Test and Evaluation Organizations</u>										
Not Applicable										
Government Furnished Property: None										
Subtotal Product Development					0	0	0	0	2,312	8,100
Subtotal Support & Management										10,412
Subtotal Test and Evaluation										
Total Project								2,312	8,100	10,412
Project 3861										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207133F F-16 Squadrons				PROJECT 2671	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2671 F-16 Squadrons	125,489	95,333	125,076	119,522	95,498	55,088	41,912	TBD	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The F-16 fighter aircraft program satisfies the need for modernization of the USAF and allied multimission tactical fighter forces. The F-16 is a single-engine, single-seat, multirole tactical fighter with full air-to-air and air-to-surface combat capabilities. The F-16 complements the F-15 in counter-air missions and is the primary aircraft in the surface attack role. The F-16C/D program develops, integrates, and qualifies systems to enhance the overall performance of the F-16 mission.

The F-16 program also develops enhanced combat capability in both the air-to-ground and air-to-air role. Improvements (all within the FYDP) include completion of the Mid-Life Update (MLU) Program, the Modular Mission Computer (MMC), Block 30 GPS Integration, Smart Weapons Integration, and Pratt & Whitney 229 Engine design improvements. The planned program also develops Close Air Support (CAS) enhancements for 250 Block 40 C/D by integrating the Night Vision Imaging System (NVIS). The F-16C/D development efforts are complemented by comprehensive Operational Flight Program (OFP) upgrades.

To meet the need beyond the turn of the century, a Mid-Life Update (MLU) of aircraft avionics is being conducted by our European partners. MLU involves various mods to European F-16A/B, including the Modular Mission Computer (MMC), which USAF Block 50s will eventually employ. The MMC will extend the cost effective life of the F-16 through replacement of three Line Replaceable Units and the addition of significant memory and processing growth provisions. The latest version of the F-16C/D has significantly improved display processors, enabling increased pilot situational awareness. Efforts are underway to upgrade the Improved Data Modem (IDM) data link capability on the Block 50 aircraft with the latest version of the High Speed Anti-Radiation Missile (HARM).

Additionally, future capability is highlighted by new developments such as: AIM-9X for Blocks 40/50, Color Displays for Blocks 40/50; Improved Flight Controls for Blocks 30/40/50; Link 16 for Blocks 40/50; MMCs added for Block 40s; Advanced Weapons Integration; Night Vision Imaging System (NVIS), Enhanced/Expanded Fire Control Computer (EEFCC); Improved Flight Control Computer for the Block 30; Improved Airborne Video Tape Recorder (IAVTR) for Block 50 and On-Board Oxygen Generating System (OBOGS) for all F-16 C/D aircraft; and Common Configuration Integration Program (CCIP) Integration (Time & Materials). CCIP will modify all Block 40 and Block 50 F-16 aircraft. CCIP pulls together several related programs under one umbrella and allows integration of AIM-9X onto F-16:

- a. The main driver for CCIP will be the Link 16 program. Link 16 is a data link that connects main components of a battle arena to maintain awareness and to share position data. The Link 16 program designs the appropriate Group A (hardware mounted permanently on aircraft) to incorporate existing Group B (hardware that is easily removed from airplane) developed by the Multifunctional Information Distribution System (MIDS) Office and adapted for use on the F-16.
- b. To enhance the display of the Link 16 data, the current black and white display will be changed out with the color display used by the European Participating Air Force countries on the MLU Program.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207133F F-16 Squadrons	PROJECT 2671
<p>c. To have sufficient computing power in the Block 40 aircraft to operate Link16 and to allow the cost savings of using a common Operational Flight Program, the MMC has to be upgraded to the same one used on the Block 50 aircraft.</p> <p>d. The Joint Helmet Mounted Cueing System (JHMCS) incorporates a man-mounted, ejection capable helmet mounted display system, with capability to cue and verify cueing of high off-axis sensors and weapons. JHMCS includes a flight helmet with display optics, image source, helmet tracker transducer w/attached cable, graphics processor/video hardware and software to drive the display, helmet tracker hardware and software, interfaces to the aircraft computers, weapons and sensor hardware, with software to integrate the JHMCS functions with other onboard systems.</p> <p>The F-16, which received Milestone III approval in FY 1977, is an operational aircraft. Since the development activities in this PE support an operational aircraft, these development activities are funded in the Operational System Development budget activity 7.</p> <p>(U) Acquisition Strategy: Procurement of additional F-16 aircraft is not funded beyond the buy of 3 provided by Congress in the FY 98 Appropriations Act. RDT&E funds will primarily be executed in developing improved capability, maintenance and safety mods. Operational Flight Program (OFP) software will be continuously updated to complement mod development efforts. The approach to contracting varies by individual project. LMTAS is the Prime on all systems except Trainer (Hughes Prime) and 229 Engines (Pratt & Whitney Prime). Contract types are CPIF, CPFF, FFP.</p> <p>(U) FY 1997 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$2,100 Completed MLU Engineering and Manufacturing Development (EMD) - (U) \$10,900 Continued MMC Upgrade Block 50 - (U) \$1,030 Continued F-16 Block 40 Close Air Support EMD - (U) \$4,400 Continued Block 30 GPS - (U) \$12,000 Continued Smart Weapons integration - (U) \$44,601 Continued OFP development - (U) \$26,400 Continued Flight Tests Developmental Test & Evaluation (DT&E) - (U) \$3,700 Started/Completed EEFC - (U) \$4,800 Continued CCIP (Time & Materials) - (U) \$1,000 Completed OBOGS development - (U) \$10,500 Started Weapon System Trainer/Unit Training Devices (UTDs) - (U) \$1,000 Completed Pratt & Whitney 229 Engines - (U) \$1,100 Started/Completed JHMCS design analysis - (U) \$1,358 Continued Government Test/Support - (U) \$600 Wright Lab Support/Studies - (U) \$125,489 Total 		
Project 2671	Page 2 of 8 Pages	Exhibit R-2 (PE 0207133F)

DATE
February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0207133F F-16 Squadrons

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0207133F F-16 Squadrons	2671
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,400 Start Link 16 Development/Integration Block 40/50 - (U) \$3,000 Continue UTDs - (U) \$37,600 Continue Flight Tests DT&E - (U) \$5,000 Complete Block 40 Close Air Support EMD - (U) \$6,200 Complete MMC on Block 50; Start MMC on Block 40 - (U) \$25,573 Continue OFP Updates - (U) \$2,000 Continue Advanced Weapons Integration - (U) \$4,700 Continue Block 30 GPS - (U) \$1,300 Continue Government Test/Support - (U) \$2,500 Start Color Display Development/Integration for Block 40/50 - (U) \$60 Start AIM-9X Development/Integration - (U) \$95,333 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$22,800 Continue Link 16 Block 40/50 - (U) \$4,300 Continue Block 40/50 Color Display Development/Integration - (U) \$32,500 Continue Flight Tests DT&E - (U) \$37,704 Continue OFP Updates - (U) \$1,293 Complete Advanced Weapons Integration - (U) \$3,200 Complete Block 30 GPS Integration - (U) \$12,000 Continue MMC for Block 40 - (U) \$4,179 Continue UTDs - (U) \$7,100 Continue AIM-9X development - (U) \$125,076 Total 		
Project 2671	Page 3 of 8 Pages	Exhibit R-2 (PE 0207133F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207133F F-16 Squadrons	PROJECT 2671
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	126,228	100,233	100,491	TBD
(U) Appropriated Value	132,202	100,233		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-2,772	-3,327		
b. SBIR	-3,202	-1,573		
c. Omnibus or Other Above Threshold Reprogram	-1,030			
d. Below Threshold Reprogramming	500			
e. Rescission	-209			
(U) Adjustments to Budget Years Since FY 1998 PB			24,585	
(U) Current Budget Submit/FY 1999 President's Budget	125,489	95,333	125,076	TBD

(U) Change Summary Explanation:

Funding: In FY 1998, \$643 cut is pending for inflation adjustment. In FY 1999, the \$24,585 adjustment includes \$20,000 transferred from procurement to accelerate CCIP, \$7,100 added for AIM-9X/JHMCS, and \$2,515 inflation adjustment cut.

Schedule: JHMCS is a new start in FY 1997 and AIM-9X is a new start in FY 1998.

Technical: The improved capabilities inherent in adding AIM-9X/JHMCS.

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Aircraft Procurement, BP10, BA-2, PE 0207133 (F-16 Squadrons)	154,278	80,654						TBD	TBD
(U) Aircraft Procurement, BP11, Mods, BA-5	112,241	172,636	229,319	244,501	278,427	254,692	206,296	TBD	TBD
(U) Aircraft Procurement, BP13, Post Production Support, BA-7	63,146	37,542	27,289	15,555	12,803	12,380	12,677	TBD	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207133F F-16 Squadrons	PROJECT 2671
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) ENGINEERING MILSTONES												
(U) Blk 50T4 FCA/PCA	*											
(U) Blk 50T5 CDR			*									
(U) T&E MILESTONES												
(U) Blk 40 CAS DT&E Start		*										
(U) CONTRACT MILESTONES												
(U) Link 16								X				
(U) JHMCS								X				
(U) MMC								X				
(U) Color Display								X				
(U) OBOGS				*								
(U) CCIP (T&M)		*										
(U) Digital Terrain System										X		
(U) Blk 30 GPS EMD												X
(U) Advanced Weapons Integration Dev												X
(U) Blk 30 NVIS												
(U) Screech Reduction for F110-229s								X				
(U) Blk 30 Fire Control Computer Mod										X		

X = Planned Events
* = Completed Events

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	
BUDGET ACTIVITY 7 - Operational System Development		February 1998	
PE NUMBER AND TITLE 0207133F F-16 Squadrons		PROJECT 2671	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Pratt & Whitney 229 Engine	1,000		
(U) LINK 16 Block 50		5,600	17,000
(U) Link 16 Block 40		1,800	5,800
(U) UTD	10,500	3,000	4,179
(U) Government Test/Support	1,358	1,300	
(U) Flight Tests DT&E	26,400	37,600	32,500
(U) MLU	2,100		
(U) Block 40 Close Air Support	1,030	5,000	
(U) MMC Block 50	10,900	3,700	
(U) MMC Block 40		2,500	12,000
(U) OFP Upgrades	44,601	25,573	37,704
(U) Smart Weapons Integration	12,000	2,000	1,293
(U) Blk 30 GPS Integration	4,400	4,700	3,200
(U) Color Display Block 50		2,100	3,000
(U) Color Display Block 40		400	1,300
(U) Studies/Wright Lab Spt/Misc.	600		
(U) OBOGS	1,000		
(U) EEFCC Blk 30	3,700		
(U) JHMCS	1,100		
(U) AIM-9X		60	7,100
(U) CCIP (Time & Materials)	4,800		
(U) Total	125,489	95,333	125,076

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207133F F-16 Squadrons				PROJECT 2671	
<u>(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Trainer (Hughes)	FFP	Apr 97	44,979	44,979	0	10,500	3,000	4,179	27,300	44,979
MLU (Lockheed/Westing/Other)	SS/CPIF	92	102,800	102,800	100,700	2,100	0	0	0	102,800
Close Air Spt (LMTAS)	Proj Orders/SS/CPIF	Jan/Feb 95	49,830	49,830	43,800	1,030	5,000	0	0	49,830
MMC Blk 50 (LMTAS)	SS/CPIF	Jan 92	269,700	269,700	255,100	10,900	3,700	0	0	269,700
MMC Blk 40 (LMTAS)	SS/CP	Apr 98	27,500	27,500	0	0	2,500	12,000	13,000	27,500
OFF Upgrades (LMTAS)	CPIF/T&M	Dec 95	TBD	TBD	39,100	44,601	25,573	37,704	TBD	TBD
Smart Wpns (LMTAS)	CPIF	Dec 95	TBD	TBD	6,900	12,000	2,000	1,293	TBD	TBD
GPS Blk 30 (Various)	FFP	Jul 97	20,200	20,200	7,900	4,400	4,700	3,200	0	20,200
Color Displays (LMTAS)	SS/CPFF	Apr 98	8,069	8,069	0	0	2,500	4,300	1,269	8,069
Link 16 Blk 50 (LMTAS)	SS/CPFF	Apr 98	32,500	32,500	0	0	5,600	17,000	9,900	32,500
Link 16 Blk 40 (LMTAS)	SS/CPFF	Apr 98	15,524	15,524	0	0	1,800	5,800	7,924	15,524
CCIP (LMTAS)	T&M	Feb 97	6,200	6,200	1,400	4,800	0	0	0	6,200

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207133F F-16 Squadrons				PROJECT 2671	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
EEFCC (LMTAS)	SS/FFP	Feb 97	3,700	3,700	0	3,700	0	0	0	3,700
OBOGS (LMTAS)	SS/CPIF	Jul 96	2,500	2,500	1,500	1,000	0	0	0	2,500
JHMCS (LMTAS)	SS/CPFF	Apr 98	1,100	1,100	0	1,100	0	0	0	1,100
AIM/9X (LMTAS)	CPAF	Apr 98	32,360	32,360	0	0	60	7,100	25,200	32,360
229 Engine (Pratt&Whitney)	SS/FFP	Dec 94	6,500	6,500	5,500	1,000	0	0	0	6,500
<u>Support and Management Organizations</u>										
Govt Test/Spt Modernization Planning Process Study			263,023	263,023	260,365	1,358	1,300	0	0	263,023
			1,400	1,400	900	500	0	0	0	1,400
<u>Test and Evaluation Organizations</u>										
Flight Tests			TBD	TBD	61,200	26,400	37,600	32,500	TBD	TBD
Wright Labs			190	190	90	100	0	0	0	190
<u>Government Furnished Equipment/Property: N/A</u>										
Subtotal Product Development					461,900	97,131	56,433	92,576	TBD	TBD
Subtotal Support and Management					261,265	1,858	1,300		0	264,423
Subtotal Test and Evaluation					61,290	26,500	37,600	32,500	TBD	TBD
Total Project					784,455	125,489	95,333	125,076	TBD	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207134F F-15E Squadrons	PROJECT 0131
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0131 Initial Operational Test and Evaluation	152,353	129,774	104,207	119,753	107,272	95,168	51,307	369,876	1,088,473
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	20 A/C

(U) A. Mission Description and Budget Item Justification

The F-15E is the most versatile fighter in the world today. Configured with conformal fuel tanks (CFTs), the F-15E can deploy worldwide with minimal tanker support and arrive combat-ready. The F-15E retains air superiority capability and adds systems, such as Low Altitude Navigation Targeting Infrared for Night (LANTIRN), to meet the requirement for all-weather, deep penetration, and night/under-the-weather, air-to-surface attack. However, the threat includes a new generation of aircraft possessing all-weather detection and kill capabilities. The F-15E's avionics, armament, airframe, and engines must be improved to maintain its superiority against the threat into the next century. Avionics updates, exploiting proven technological advances, are being incorporated into the F-15E providing expanded capability and supporting an updated and fully integrated electronic warfare suite. As a result, this project develops enhanced offensive and defensive capability and survivability. (The F-15E PE also funds RDT&E activities for PE # 0207130, F-15A-D). The F-15E, which received contract award approval in FY84, is an operational aircraft and therefore the development activities in the PE are included in Budget Activity 7, Operational Systems Development.

(U) Acquisition Strategy: Program is a continuation of effort which includes the development of all F-15 models. Current contract award information is contained in R-3, Section B, "Budget Acquisition History and Planning Information". Funds are executed organically in support of equipment improvement, study, analysis, and test.

(U) FY 1997 (\$ in Thousands):

- (U) 64,838 Continued development and testing of F-15 improvements to APG-63 radar.
- (U) 34,056 Continued Operational Flight Program (OFP) development efforts.
- (U) 25,092 Continued flight test of the OFP and flight testing of improvements initiated in prior years.
- (U) 15,000 Development of ALQ-135, Band 1.5
- (U) 5,963 Continued improvements contributed to Diminishing Manufacturing Sources (DMS).
- (U) 5,156 Continued development of Programmable Armament Control Set (PACS) upgrade.
- (U) 1,200 TEWS Intermediate Support System (TISS) replacement
- (U) 1,000 Completed development of -229 engine improvements.
- (U) 48 Repaired government furnished equipment used for R&D.
- (U) 152,353 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207134F F-15E Squadrons	PROJECT 0131
(U) <u>FY 1998 (\$ in Thousands):</u>		
-	(U) 35,475	Continue OFP development efforts.
-	(U) 32,006	Completes development and improvements of the APG-63 radar.
-	(U) 15,300	Continue flight test of the OFP and flight testing of improvements initiated in prior years.
-	(U) 15,900	Continue development of ALQ-135, Band 1.5
-	(U) 5,650	Continue improvements attributed to DMS.
-	(U) 5,170	Development of the Joint Helmet Mounted Cueing System (JHMCS).
-	(U) 15,000	Development of the Link-16 data link for the F-15E.
-	(U) 2,360	TISS replacement
-	(U) 1,790	Development of the Combat Identification (ID) System.
-	(U) 600	Repair government furnished equipment used for R&D.
-	(U) 523	Continue development of PACS upgrade.
-	(U) 129,774	Total
(U) <u>FY 1999 (\$ in Thousands):</u>		
-	(U) 41,748	Continue OFP development efforts.
-	(U) 20,200	Continue flight test of the OFP and flight testing of improvements initiated in prior years.
-	(U) 5,900	Continue development of the Link-16 data link for the F-15E.
-	(U) 11,445	Continue development of the ALQ-135 Band 1.5.
-	(U) 8,600	Continue developments attributed to DMS.
-	(U) 4,674	Continue development of the Combat ID System.
-	(U) 5,080	Continued development of the JHMCS.
-	(U) 3,490	Development of the Air Data Processor (ADP).
-	(U) 1,730	Continue development of PACS upgrade.
-	(U) 740	TISS replacement
-	(U) 600	Repair government furnished equipment used for R&D.
-	(U) 104,207	Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207134F F-15E Squadrons	PROJECT 0131
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(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget FY 1998 PB	150,981	137,538	109,798	1,131,159
(U) Appropriated Value	158,095			
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-3,326	-4,519		
b. SBIR	-3,788	-3,245		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	+1,622			
e. Recissions	-250			
(U) Adjustments to Budget Years Since FY 1998 PB			-5,591	
(U) Current Budget Submit/FY 1999 President's Budget	152,353	129,774	104,207	1,088,473

(U) (U) Change Summary Explanation:

Funding: \$3,495 reprogrammed in FY97 from Joint Helmet Mounted Cueing System (JHMCS). FY97 BTR also includes -\$1,873 for a cancellation bill. For the FY98 funds, \$882,000 is pending reprogramming to fund higher priorities and \$18,000 is pending for additional SBIR reduction.

Schedule: No changes.

Technical: No changes.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207134F F-15E Squadrons	PROJECT 0131
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>
(U) Aircraft Procurement BP10 (PE27134F)	247,021	231,989	0	0	0	0	0	0	TBD
(U) Aircraft Procurement BP11 (Mods) (PEs 27130F and 27134F)	132,280	177,272	196,579	220,140	248,239	303,174	313,072	TBD	TBD
(U) Aircraft Procurement BP 11 (Mods) (PE27442F)	0	0	0	0	0	8,519	22,387	TBD	TBD
(U) Aircraft Procurement BP13 (Post Prod Spt)	7,786	6,074	7,851	7,732	7,714	7,820	8,029	TBD	TBD

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) JHMCS DT start					*							
(U) JHMCS OT start											X	
(U) PACS DT&E complete				*								
(U) OFP Suite 3												
(U) MSIP OT&E complete				*								
(U) E-model OT&E start				*								
(U) MSIP release					X							
(U) E-model release									X			
(U) OFP Suite 4 VCC CDR											X	
(U) APG-63 ground integration test start	*											
(U) APG-63 DT flight test start				*								
(U) APG-63 OT flight test start										X		
(U) Link-16 DT start											X	
(U) Combat ID DT start											X	
(U) ALQ-135, Band 1.5 DT&E start						X						
(U) ALQ-135, Band 1.5 OT start											X	
(U) TISS replacement				*								
(U) Air Data Processor EMD start											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207134F F-15E Squadrons	PROJECT 0131
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Flight Test	25,092	15,300	20,200
(U) OFP	34,056	35,475	41,748
(U) Link-16 data link	0	15,000	5,900
(U) APG-63(V)1	64,838	32,006	0
(U) Helmet Mounted Cueing System	0	5,170	5,080
(U) GFE/GFP Repair	48	600	600
(U) Falcon -229	1,000	0	0
(U) Parts Obsolescence	5,963	5,650	8,600
(U) PACS Upgrade	5,156	0,523	1,730
(U) Combat ID	0	1,790	4,674
(U) ALQ-135 Band 1.5	15,000	15,900	11,445
(U) Air Data Processor	0	0	3,490
(U) TISS Replacement	1,200	2,360	740
(U) Total	152,353	129,774	104,207

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207134F F-15E Squadrons				PROJECT 0131	
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
P&W (-229 Eng)	CPAF	Sep 94	6,520	6,520	5,520	1,000	0	0	0	6,520
GE (-129 Eng)			7,130	7,130	7,130	0	0	0	0	7,130
Boeing (GFE/GFP)	FFP	Dec 93	4,475	4,475	1,327	48	600	600	1,900	4,475
OFF Suite 4 Development	CPAF	May 98	257,040	257,040	37,246	34,056	35,475	41,748	108,515	257,040
Boeing APG63 (Feasibility Study)	CPFF	Feb 94	778	778	778	0	0	0	0	778
(Risk Reduction)	CPFF	Feb 94	9,892	9,892	9,892	0	0	0	0	9,892
(EMD)	CPAF	Sep 94	234,512	234,512	137,668	64,838	32,006	0	0	234,512
Boeing (JHMCS A-D)	CPAF		14,230	14,230		0	5,170	5,080	3,980	14,230
PACS Upgrade	CPAF	May 95	38,819	38,812	21,731	5,156	523	1,730	10,100	39,240
Wright Lab (DMS)	MIPR/PRs	Sep 94	58,789	58,789	12,046	5,963	5,650	8,600	26,530	58,789
Smart Weapons Integration	CPAF	Nov 99	40,640	40,640	0	0	0	0	40,640	40,640
ADP(E)	CPAF	Jan 99	5,280	5,280	0	0	0	3,490	1,790	5,280
ADCP(E)	CPAF	Dec 99	53,280	53,280	0	0	0	0	53,280	53,280
NGA (ALQ-135 Band 1.5)	FFP	May 97	42,345	42,345	0	15,000	15,900	11,445	0	42,345
Link-16 data link	CPFF	Feb 98	20,900	20,900	0	0	15,000	5,900	0	20,900
Project 0131					Page 6 of 8 Pages			Exhibit R-3 (PE 0207134F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207134F F-15E Squadrons			PROJECT 0131		
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	Budget FY 1999	Budget to Complete	Total Program
Combat ID	CPAF	May 98	16,750	16,750	0	0	1,790	4,674	10,286	16,750
TISS Replacement	CPFF	Aug 97	4,700	4,700	0	1,200	2,360	740	400	4,700
<u>Support and Management Organizations</u>										
(Msn Spt) Misc.					16,708	0	0	0	0	16,708
<u>Test and Evaluation Organizations</u>										
Boeing (Flt Test)	FFP	Oct 96			41,315	9,980	9,579	7,000	33,000	100,874
Edwards (OFP)	PO	Oct 96			31,492	12,512	5,391	8,400	64,455	122,250
Eglin (Flt Test)	PO	Oct 96			9,410	2,600	330	4,800	15,000	32,140

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207134F F-15E Squadrons	PROJECT 0131
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(U) B. Budget Acquisition History and Planning Information (Continued \$ in Thousands)

Government Furnished Property: The F-15 program funds for the repair of government furnished property (GFP) purchased and available for support of F-15 research and development. The GFP consists of avionics line replaceable units, special test equipment, flight test instrumentation, and special tooling needed by Boeing Aerospace and Northrop-Grumman to complete development on several F-15 aircraft hardware and software enhancements. Assets are rotated among several F-15 development contracts on an as needed basis and repaired organically through the network of repair contracts managed by the various Air Logistics Centers.

	<u>Total</u>	<u>Prior to</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget</u>	<u>Budget to</u>	<u>Total</u>
	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
Subtotal Product Development	233,338	127,261	114,474	84,007	257,421	816,501		
Subtotal Support and Management	16,708					16,708		
Subtotal Test and Evaluation	82,217	25,092	15,300	20,200	112,455	255,264		
Total Project	332,263	152,353	129,774	104,207	369,876	1,088,473		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207136F Manned Destructive Supression	PROJECT 4595
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4595 F-16 HARM Targeting System (HTS)	13,130*	12,259	2,443	0	0	0	0	0	55,278
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

*For FY97 and prior, the project number was 2671. The project number was changed to 4595 starting in FY98 for administrative reasons.

(U) A. Mission Description and Budget Item Justification

The overall Manned Destructive Suppression (MDS) program funds the development, procurement and sustainment of the Air Force's lethal Suppression of Enemy Air Defenses (SEAD) capability. The program provides certain F-16 aircraft the capability to carry and employ the AGM-88 High-Speed Anti-Radiation Missile (HARM). The F-16C/Blk 50 has been modified to carry the AN/ASQ-213 HARM Targeting System (HTS) for real-time targeting, and "range known" HARM employment -the missile's most lethal mode. The RDT&E efforts are focused on making the HTS system more capable in advanced threat environments. This PE is in Budget Activity 7- Operational System Development because it supports HTS upgrade development.

(U) Acquisition Strategy:

The HTS program objective is to develop an enhanced HARM Targeting System capability that improves HARM effectiveness on F-16C/Blk 50 aircraft. The objective will be accomplished by EMD efforts that significantly upgrade and increase the aircraft real-time, reactive Suppression of Enemy Air Defenses(SEAD).

(U) FY 1997 (\$ in Thousands)

- (U) 7,432 Continued Engineering and Manufacturing Development (EMD) of HTS Upgrade.
- (U) 914 Developed HTS Air Force Mission Support System (AFMSS) modifications.
- (U) 908 Began HTS Test and Evaluation.
- (U) 1,476 Mission Support
- (U) 2,400 Aircraft/Systems Integration
- (U) 13,130 **Total**

(U) FY 1998 (\$ in Thousands)

- (U) 7,665 Continue EMD of HTS Upgrade development.
- (U) 866 Develop HTS Air Force Mission Support System (AFMSS) modifications.
- (U) 2,427 Continue HTS Test and Evaluation.
- (U) 1,301 Mission Support
- (U) 12,259 **Total**

DATE
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BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0207136F Manned Destructive Supression

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207136F Manned Destructive Supression	PROJECT 4595																																																							
<p>(U) <u>FY 1999 (\$ in Thousands)</u></p> <p>– (U) 1,809 Continue EMD of HTS upgrade development.</p> <p>– (U) 487 HTS Test and Evaluation.</p> <p>– (U) 147 Mission Support</p> <p>– (U) 2,443 Total</p>																																																									
<p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 35%;"></th> <th style="text-align: right; width: 10%;"><u>FY 1997</u></th> <th style="text-align: right; width: 10%;"><u>FY 1998</u></th> <th style="text-align: right; width: 10%;"><u>FY 1999</u></th> <th style="text-align: right; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">11,821</td> <td style="text-align: right;">13,561</td> <td style="text-align: right;">2,492</td> <td style="text-align: right;">56,629</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">12,384</td> <td style="text-align: right;">13,561</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value:</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. General Congressional Reductions</td> <td style="text-align: right;">-263</td> <td style="text-align: right;">-474</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-300</td> <td style="text-align: right;">-828 *</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td style="text-align: right;">1,329</td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Rescissions</td> <td style="text-align: right;">-20</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY98 PB</td> <td></td> <td></td> <td style="text-align: right;">-49</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">13,130</td> <td style="text-align: right;">12,259</td> <td style="text-align: right;">2,443</td> <td style="text-align: right;">55,278</td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	11,821	13,561	2,492	56,629	(U) Appropriated Value	12,384	13,561			(U) Adjustments to Appropriated Value:					a. General Congressional Reductions	-263	-474			b. SBIR	-300	-828 *			c. Omnibus or Other Above Threshold Reprogramming					d. Below Threshold Reprogramming	1,329				d. Rescissions	-20				(U) Adjustments to Budget Years Since FY98 PB			-49		(U) Current Budget Submit/FY 1999 President's Budget	13,130	12,259	2,443	55,278
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(U) Current Budget Submit/FY 1999 President's Budget	13,130	12,259	2,443	55,278																																																					
<p>(U) Change Summary Explanation:</p> <p>Funding:</p> <ul style="list-style-type: none"> • FY 97 funds (\$1,329M) were added for Upgrade Plus EMD contract effort, R6 flight test efforts, and mission planning. • An additional SBIR reduction of \$28,000 is planned*. • FY99 reductions for an economic adjustment. <p>Schedule: N/A</p> <p>Technical: N/A</p>																																																									
<p>Project 4595 Page 2 of 5 Pages Exhibit R-2 (PE 0207136F)</p>																																																									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207136F Manned Destructive Supression				PROJECT 4595	
(U) C. Other Program Funding Summary (\$ in Thousands)									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) HTS Aircraft Procurement (BP11) AF PE 0207136F	0	12,172	3,314	138	0	0	0	0	22,648
(U) HTS Aircraft Procurement (BP19) AF PE 0207136F	0		12,855	0	0	0	0	0	12,855
(U) HTS Ops & Maintenance, AF PE 0207136F	0	8,754	10,960	6,995	7,814	8,483	8,294	Continuing	TBD
<u>Related RDT&E:</u> PE 0207133F, F-16 Squadrons.									
NOTE: FY97-FY01 funding includes Air Force MSS (AFMSS) and WTT sustaining support, contractor sustaining engineering, depot development, repair, program office support and other related support activities.									
(U) D. Schedule Profile									
		<u>FY 1997</u>			<u>FY 1998</u>		<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	
(U) F-16 HTS Upgrade Development*								X	
(U) New Buy Lot 2 Contract Award								X	
(U) Retrofit Contract Award					X				
(U) New Buy Lot 1 Pod Deliveries					X	X			
(U) New Buy Lot 2 Pod Deliveries									
(U) R6 Fielding								X	
*Note: This effort started second quarter FY96									
Project 4595			Page 3 of 5 Pages				Exhibit R-2 (PE 0207136F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207136F Manned Destructive Supression	PROJECT 4595
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(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) HTS Upgrade Project			
(U) HTS Pod Development	7,432	7,665	1,809
(U) Aircraft/System Integration	2,400		
(U) Test & Evaluation	908	2,427	487
(U) Training & Support Equip Development	914	866	
(U) Mission Support	1,476	1,301	147
(U) Total	13,130	12,259	2,443

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207136F Manned Destructive Supression					PROJECT 4595	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program	
<u>Product Development Organizations</u>											
Raytheon/TI Systems	SS/CPAF	Various	6,808	6,808	6,532	276			0	6,808	
Raytheon/TI Systems	SS/CPAF	Feb 96	27,680	28,400	17,474	7,329	7,665	1,809	0	34,277	
Lockheed Ft Worth AFMSS	TBD	Various			32	2,400 882	866		0	2,400 1,780	
<u>Support and Management Organizations</u>											
Prog. Office Spt	Various	Various			1,909	1,405	1,301	147	0	4,762	
<u>Test and Evaluation Organizations</u>											
Eglin	PO	Various			204	697	941	412	0	2,254	
Edwards	PO	Various			373	141	1,486	75	0	2,075	
Light Defender Support Orgs.		Various			922					922	
Government Furnished Property: Not Applicable.											
Subtotal Product Development					24,038	10,887	8,531	1,809	0	45,265	
Subtotal Support and Management					1,909	1,405	1,301	147	0	4,762	
Subtotal Test and Evaluation					1,499	838	2,427	487	0	5,251	
Total Project					27,446	13,130	12,259	2,443	0	55,278	
Project 4595											
Page 5 of 5 Pages											
Exhibit R-3 (PE 0207136F)											

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207141F F-117A Squadrons	PROJECT 3956
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3956 F-117A Stealth Fighter	11,777	8,964	5,147	4,896	2,903	2,361	3,642	11,446	55,589
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The F-117A is the world's first operational low-observable (LO) combat aircraft. Its combination of stealth and precision weapons delivery capability allows the United States Air Force to hold even the most highly defended targets at risk. This program provides funds to develop improved systems for the F-117A aircraft. These improvements will enhance combat capability while maintaining a safe, reliable, and supportable aircraft. The F-117A is projected to be in service through at least 2015. The major research budget activity category is operational systems development; however, some of the research is engineering and manufacturing development (EMD). The final F-117A delivery to the Air Force (number 59) was in July 1990. The program is well past production and into sustainment. The single operational F-117A unit, the 49th Fighter Wing, is stationed at Holloman AFB, NM. The program uses Aircraft Procurement Air Force (APAF) modification (BA-5) money for an extensive modification program to keep the F-117A current with operational system and reliability/maintainability upgrades. Most modification projects require development efforts, funded with RDT&E money, before they are integrated into the fleet. Additionally, F-117A RDT&E funding supports integration, threat system, and technology studies, as required by the user.

This project provides research and development for multiple modifications to the F-117A weapons system. The first FY 99 RDT&E effort continues development work for the MIL-STD-1760 Stores Management Processor (SMP). This modification facilitates integration of advanced weapons on the F-117A, specifically, the Joint Direct Attack Munition (JDAM) and the Wind Corrected Munitions Dispenser (WCMD). The Single Configuration Fleet (SCF) sub-project includes development of new spray coating application techniques and panel access technologies to improve the reliability and maintainability of the weapon system. SCF development concludes in FY 98 and the modification effort begins in FY 99. This modification allows the weapon system to move toward a single, standard configuration for all F-117 airframes, fleetwide. This sub-project also includes efforts to integrate a single leading edge configuration, compatible with the overall Low Observable aircraft system. The next effort continues development for actual Smart Weapons Integration, JDAM and WCMD, on the F-117. This program is in budget activity 7, Operational System Development, because all aircraft have been delivered and the program is in its deployment phase.

(U) Acquisition Strategy: RDT&E funds are executed in developing improved capability, maintenance, and safety modification development efforts. Operational Flight Program (OFP) software is continuously updated (Block Cycle Update every 3 years) to complement modification development efforts. The contracting approach varies by individual project and involves Firm Fixed Price (FFP), Cost Plus Fixed Fee (CPFF), and Cost Plus Award Fee (CPAF) contract types.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207141F F-117A Squadrons	PROJECT 3956
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(U) **A. Mission Description and Budget Item Justification - Continued**

(U) FY 1997 (\$ in Thousands):

- (U) \$5,300 Continued development work on Stores Management Processor (SMP) (formerly known as MIL-STD-1760)
- (U) \$4,524 Continued development work on Single Configuration Fleet (SCF) (formerly known as RAM recoating)
- (U) \$1,953 Completed development work on Ozone Depleting Chemical
- (U) \$11,777 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$4,669 Continue development work on SMP
- (U) \$4,295 Complete development work on SCF
- (U) \$8,964 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$4,855 Continue development work on SMP
- (U) \$292 Start Smart Weapons Integration
- (U) \$5,147 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207141F F-117A Squadrons	PROJECT 3956
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget: FY 98 PB	11,797	9,520	5,251	44,416
(U) Appropriated Value	12,050	9,520		
(U) Adjustments to Appropriated Value				
a. Congressional General Reductions/Rescissions	-253	-311		
b. SBIR		-245		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Recissions	-20			
(U) Adjustments to Budget Years Since FY 1998 PB			-104	
(U) Current Budget Submit/FY99 President's Budget	11,777	8,964	5,147	55,589

(U) Change Summary Explanation:

Funding: A total of \$556K was removed in FY 98 for Congressional General Reductions and SBIR. \$289K removed from SMP project and \$267K removed from the integration of new smart weapons into Block 2 upgrades. In FY 99, \$104K was removed as an inflation adjustment.

Schedule: Delayed planned start of smart weapons integration from FY 98 to FY 99.

Technical: Reduction of funds removed new smart weapons integration from Block 2 upgrades increasing risk of conflict between software modules.

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Aircraft Procurement (BA-5), Appn 3010/BP1100, AF F117A Squadrons, PE 27141F	28,819	27,657	25,654	28,843	31,536	29,354	22,542	TBD	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207141F F-117A Squadrons	PROJECT 3956
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(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				
1	2	3	4	1	2	3	4	1	2	3	4
(U) F3 IRADS (RDT&E Start FY93, Retrofit Start Mar 95, Finished Jan 97)	*										
(U) RNIP+ (RDT&E Start Aug 91, Retrofit Started Oct 96 Finish Dec 99)	*										
(U) AP-102 Computer Upgrade (Retrofit Started Oct 96, Finish Jun 00)	*										
(U) Stores Management Processor (SMP) (RDT&E Start Jul 96; Retrofit Start May 00, Finish Sep 03)											
(U) High Temperature Edges Retrofit CA FY 2/93, Finish FY 2/98)					X						
(U) Single Configuration Fleet (SCF) (RDT&E Start Apr 96, Retrofit CA FY 2/99, Finish FY 3/04)									X		
(U) Replace Life-Limited Skin Panels & Web Retrofit CA FY 2/99, Finish FY 2/04									X		
(U) Ozone Depleting Chemical upgrade (RDT&E Started Sep 97, Retrofit Start Sep 99 Finish Dec 03)				*							X
(U) Smart Weapons Integration (RDT&E Started Oct 97)					*						
(U) Icing Detection and Protection (Retrofit CA FY 3/93, Retrofit Start FY 3/93, Finish FY 2/98)							X				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207141F F-117A Squadrons				PROJECT 3956		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
			<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>					
(U)	Development work on SMP (MIL-STD-1760)		5,300	4,669	4,855					
(U)	Development work on SCF (RAM Recoating)		4,524	4,295						
(U)	Development work on Ozone Depleting Chemical		1,953							
(U)	Smart Weapons Integration				292					
(U)	Total		\$11,777	8,964	5,147					
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
	Contract									
	Method/Type									
	or Funding									
	Award or									
	Obligation									
	Performing									
	Activity									
	Project									
	Office									
	Total									
	Prior to									
	FY 1997									
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	Budget									
	FY 1997									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207141F F-117A Squadrons				PROJECT 3956	
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Compl</u>	<u>Total Program</u>
Ozone Depleting Chemical Modification										
Lockheed Martin Skunk Works (Ozone), Palmdale CA	CPFF	Sep 97	2,759	2,759	806	1,953	0	0	0	2,759
Smart Wpn Integration Sacramento Air Logistics Center, McClellan AFB, CA	FFP	Oct 97	22,523	22,523	0	0	0	292	22,231	22,523
Fuel Quantity Processor Contractor TBD	TBD	FY 02	TBD	657	0	0	0	0	657	657
<u>Support and Management Organizations</u> N/A										
<u>Test and Evaluation Organizations</u> N/A										
Government Furnished Property: N/A										
Subtotal Product Development					4,453	11,777	8,964	5,147	25,248	55,589
Subtotal Support and Management					0	0	0	0	0	0
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					4,453	11,777	8,964	5,147	25,248	55,589

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207161F Tactical AIM Missile	PROJECT 4132
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4132 AIM-9 Product Improvement	29,245	51,199	52,966	40,807	16,993	2,695	0	0	212,884
Quantity of RDT&E Articles	0	5	7	11	0	0	0	0	23

Note: The RDT&E articles are deliverables under the Engineering and Manufacturing Development contract and are not separately priced.

(U) A. Mission Description and Budget Item Justification

The AIM-9 Sidewinder short range air-to-air missile is a launch and leave, air combat munition that uses passive infrared (IR) energy for acquisition and tracking of enemy aircraft and complements the Advanced Medium Range Air-to-Air Missile. Air superiority in the short range air-to-air missile arena is essential and includes first shot, first kill opportunity against an enemy employing IR countermeasures. Improvements in missile seeker and kinematics allow retrofit of components to current missiles to the maximum extent possible. Anti-Tamper features will be incorporated to protect improvements inherent in this design. Retrofitting of components will extend the operational effectiveness of existing inventories at an affordable cost while continuing evolution of the AIM-9 series. AIM-9X is an ACAT I joint-service program with Navy lead. This program is in budget activity 7 - Operational System Development, since the AIM-9X is a long-term evolution to the AIM-9, a fielded system .

(U) Acquisition Strategy:

The Joint Air Force/Navy Short Range Air-to-Air Missile (SRAM) Upgrade Program objective is development and upgrade of the AIM9X missile to counter the AA-11+ threat. This is an ACAT 1D program with the Navy as lead Service; the Air Force is a participating Service and jointly manages the program. Key provisions of the acquisition strategy are development of improved maneuverability of the airframe, improvement of Infra Red Imaging Midwave FPA seeker technology with high OBA gimbal, evolutionary design/modification of rocket motor, warhead, and fuse. Ultimate goal of this strategy is to maximize US capability to achieve day/night air-to-air superiority in a robust infra-red countermeasure environment through development of improved airframe guidance and control capability while maximizing sub-component utilization of AIM-9M fuse.

(U) FY 1997 (\$ in Thousands):

- (U) \$17,270 AIM-9X EMD
- (U) \$ 9,975 Continued sustaining engineering and in-house efforts
- (U) \$ 2,000 Began EMD development test. Conduct DT-IIA (captive carry tests)
- (U) \$29,245 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0207161F Tactical AIM Missile	4132
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$35,080 Continue manufacturing development, conduct Design Review II (DR II), fly captive test units, and start delivery of safe separation vehicles for DT-IIB- (U) \$ 5,144 Continue providing aircraft interface information to EMD contractor to include any available wind tunnel tests- (U) \$ 3,535 Continue preparations for DT-IIB and start DT-IIB- (U) \$ 7,440 Provide for consulting services, technical engineering, and management support- (U) \$51,199 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$31,505 Continue the manufacturing development contract- (U) \$ 6,602 Continue providing aircraft interface to the EMD contractor. Incorporate results of wind tunnel- (U) \$ 9,550 Complete DT-IIB, start DT-IIC and start OT-IIA- (U) \$ 5,309 Provide for consulting services, technical engineering, and management support- (U) \$52,966 Total		
Project 4132	Page 2 of 7 Pages	Exhibit R-2 (PE 0207161F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207161F Tactical AIM Missile	PROJECT 4132
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Missile Procurement, Budget Activity 2, PE 0207161F, Program Title: Tactical AIM Missile				32,162	35,653	62,326	66,705	1,090,642	1,287,488
(U) Missile Procurement, Budget Activity 2, PE 0207590F, Program Title: SEEK EAGLE					6,005	0	8,395	0	14,400

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207161F Tactical AIM Missile	PROJECT 4132
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Acquisition Milestones MS II	X											
(U) Engineering Milestones DR I DR II				X		X						
(U) Test and Evaluation Milestones DT-IIA (Captive Carry) Wind Tunnel Tests for F-15 & F-18 DT-IIB (Safe Separation) DT-IIC (Guided Launches) Conduct Insensitive Munitions Tests OT-IIA (Guided Launches)			X			X		X		X		
(U) Contract Milestones EMD Award	X											X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207161F Tactical AIM Missile			PROJECT 4132		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Project Cost Categories										
a.	Primary Hardware Development			17,270	35,080	31,505				
b.	Government Engineering Support			4,900	2,476	957				
c.	Contractor Engineering Support			4,180	5,144	6,602				
d.	Miscellaneous			720	4,760	4,131				
e.	Development Test and Evaluation			2,000	3,535	9,550				
f.	Travel			175	204	221				
(U)	Total			29,245	51,199	52,966				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government	Contract Method/Type	Award or Obligation Date	Performing Activity	Project Office	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Activity</u>	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
<u>Product Development Organizations</u>										
Hughes	C/CPIF	Dec 94	5,694	5,694	5,694					5,694
Raytheon	C/CPIF	Dec 94	5,695	5,695	5,695					5,695
Hughes (EMD)*	C/CPIF	Dec 96	113,720	113,720		17,270	35,080	31,505	29,865	113,720
McDon-Doug#	C/CPIF	Jan 96	18,588	18,588	181	4,180	5,144	6,602	2,481	18,588
Field Activities	PO	Oct 96	N/A	N/A	5,955	6,900	6,011	10,507	20,985	50,358
Misc. In-House	PO		N/A	N/A	898	761	4,384	3,798	6,032	15,873
*Note: Hughes became part of Raytheon Systems effective Dec 97.										
#Note: McDonnell-Douglas became part of Boeing effective Aug 97.										
<u>Support and Management Organizations</u>										
Various Contracts	FFP		N/A	N/A	559	134	580	554	1,129	2,956
<u>Test and Evaluation Organizations</u> (Included in product improvement)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE
BUDGET ACTIVITY										PROJECT
7 - Operational System Development										4132
PE NUMBER AND TITLE										
0207161F Tactical AIM Missile										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Government Furnished Property:										
NA										
Subtotal Product Development					18,423	29,111	50,619	52,412	59,363	209,928
Subtotal Support and Management					559	134	580	554	1,129	2,956
Subtotal Test and Evaluation										
Total Project					18,982	29,245	51,199	52,966	60,492	212,884

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207163F Adv Med Range A/A Msl	PROJECT 3777
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	Cost to Complete	Total Cost
3777 AMRAAM	9,704	39,875	45,078	47,289	41,815	37,008	27,941	TBD	143,500	664,031
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The Air Force and Navy developed the baseline Advanced Medium Range Air-to-Air Missile (AMRAAM) as a high performance, all weather missile to counter existing air vehicle threats operating at high or low altitude and having advanced Electronic Protection (EP) capabilities. The AMRAAM Pre-planned Product Improvement (P3I) program provides for a continuing, Joint Air Force/Navy research and development program which enables AMRAAM to: (1) be compatible with advanced fighters, (2) enhance AMRAAM capability and operational flexibility against mid-1990's and beyond threats, (3) incorporate high payoff technology developments, and (4) investigate new variants and/or alternate missions which may use many baseline missile attributes. Currently, improvements under the P3I program include enhanced EP capabilities; improved weapon effectiveness through improved warhead, fuzing, and guidance; and increased kinematics via a new 5-inch stretched rocket motor. This program is in budget activity 7 - Operational System Development, providing upgrades to the AIM-120C missile now in production.

(U) Acquisition Strategy:

The AMRAAM program is an Air Force ACAT 1C program. The Air-To-Air Joint System Program Office (JSPO) provides AMRAAM missile test assets for all development and operational tests conducted on the system, subsystems, components, and rail launchers. The JSPO develops system performance specifications at the missile level, for which it will retain configuration control.

Management of the AMRAAM program includes a price-based acquisition strategy offered to a single AMRAAM Prime Contractor as a "Total Package Deal." The "Deal" includes a Long Term Pricing Agreement (LTPA), Total System Performance Responsibility (TSPR), and sustainment activities to include depot level repair. This contractor will produce all AMRAAM missiles, provide technical support, sustain fielded missiles and perform depot and development activity. The net effect reduces total program costs.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 250 Continued P3I Phase 2 Engineering and Manufacturing Development (EMD) for EP, weapons effectiveness improvements and initiated kinematic improvements (5-inch rocket motor)
- (U) \$ 4,940 Continued Phase 3 risk reduction to enhance EP and guidance
- (U) \$ 3,437 Mission support
- (U) \$ 1,077 Test and evaluation

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207163F Adv Med Range A/A Msl	PROJECT 3777																																																							
<p>– (U) \$9,704 Total</p> <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <p>– (U) \$25,383 Complete P3I Phase 2 EMD for EP, weapons effectiveness, and kinematic improvements</p> <p>– (U) \$ 7,668 Complete Phase 3 risk reduction to enhance EP and guidance</p> <p>– (U) \$ 3,297 Mission support</p> <p>– (U) \$ 3,527 Test and evaluation</p> <p>– (U) \$39,875 Total</p> <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <p>– (U) \$ 7,000 Conduct P3I Phase 3 improved EP fuzing capability</p> <p>– (U) \$ 28,060 Initiate P3I Phase 3 EP and guidance EMD</p> <p>– (U) \$ 3,219 Mission support</p> <p>– (U) \$ 6,799 Test and evaluation</p> <p>– (U) \$ 45,078 Total</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget/FY 1998 PB</td> <td style="text-align: right;">24,745</td> <td style="text-align: right;">50,781</td> <td style="text-align: right;">45,985</td> <td style="text-align: right;">664,031</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">25,883</td> <td style="text-align: right;">43,781</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Congressional General Reductions</td> <td style="text-align: right;">-593</td> <td style="text-align: right;">-1851</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-545</td> <td style="text-align: right;">-2055</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td style="text-align: right;">-14,000</td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td style="text-align: right;">-1,000</td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td style="text-align: right;">-41</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-907</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">9,704</td> <td style="text-align: right;">39,875</td> <td style="text-align: right;">45,078</td> <td style="text-align: right;">664,031</td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget/FY 1998 PB	24,745	50,781	45,985	664,031	(U) Appropriated Value	25,883	43,781			(U) Adjustments to Appropriated Value					a. Congressional General Reductions	-593	-1851			b. SBIR	-545	-2055			c. Omnibus or Other Above Threshold Reprogram	-14,000				d. Below Threshold Reprogramming	-1,000				e. Rescissions	-41				(U) Adjustments to Budget Years Since FY 1998 PB			-907		(U) Current Budget Submit/FY 1999 President's Budget	9,704	39,875	45,078	664,031
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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Project 3777	Page 2 of 7 Pages	Exhibit R-2 (PE 0207163F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207163F Adv Med Range A/A Msl	PROJECT 3777
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(U) Change Summary Explanation:

Funding: In FY97, \$14M was removed from the program for Omibus Above Threshold Reprogramming. In FY99, a non pay purchase inflation reduction occurred.

Schedule: Due to Phase 2 restructure, flight testing will be completed in Sep 98. The Phase 3 contract award was delayed to Oct 98 due to FY98 congressional language, therefore, the PDR will be moved to 3QFY99.

Technical: Due to the FY98 Congressional Budget reductions and rephasing language, the improved EP fuzing capability was moved to Phase 3 with FY99 completion.

(U) **C. Other Program Funding Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Missile Procurement, Budget Activity: #2									
(U) BP20 AMRAAM	110,605	104,016	114,627	107,219	105,045	127,637	123,112	502,110	6,833,276
(U) BP25 Replenishment Spares	11,885	0	5,236	10,557	10,441	10,447	10,347	Continuing	153,534
(U) BP26 Initial Spares	3,853	1,057	2,661	2,701	2,654	2,708	2,791	Continuing	79,828

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207163F Adv Med Range A/A Msl	PROJECT 3777
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) P3I Phase 2 Tape 7A FCA			X									
(U) P3I Phase 2 Tape 7B PDR/CDR				X								
(U) P3I Phase 2 Tape 7A Flt Test Comp			X									
(U) P3I Phase 2 Tape 7B Flt Test Comp								X				
(U) P3I Phase 2 Warhead CDR/FCA				X								
(U) P3I Phase 2 SCAS CDR/FCA						X						
(U) P3I Phase 2 Rocket Motor CDR/FCA					X							
(U) P3I Phase 3 Fuzing FCA												X
(U) P3I Phase 3 EMD Contract Award									X			
(U) P3I Phase 3 PDR											X	

"X" = Completion or Milestone

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207163F Adv Med Range A/A Msl			PROJECT 3777		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) a.	Contract/Cost and Operational Effectiveness Analysis (COEA)			5,191	33,051	35,060				
(U) b.	Government Costs (Test, Support)			1,907	4,034	7,004				
(U) c.	GFE			0	0	323				
(U) d.	Contractor Support			2,606	2,790	2,691				
(U) Total				9,704	39,875	45,078				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Misc. Contracts Various	FFP	Dec 95 - Mar 96	N/A	N/A	7,658	740	140	140	8,823	17,501
F08635-90-C-0201 Hughes*	FFP	Aug 90	N/A	N/A	5,200	0	0	0	0	5,200
F08626-91-C-0034 Hughes	CPIF	Mar 91	91,704	93,506	93,506	0	0	0	0	93,506
F08626-93-C-0044 (Phase 2) Hughes	CPAF	Jun 94	118,442	114,893	87,822	110	26,961	0	0	114,893
Phase 3 Risk Reduction		Oct 95	N/A	N/A	16,351	4,341	5,950	0	0	26,642
Project 3777										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE
BUDGET ACTIVITY										February 1998
7 - Operational System Development					PE NUMBER AND TITLE					PROJECT
					0207163F Adv Med Range A/A Msl					3777
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Phase 3 Improved Fuzing Capability		1QFY99					0	7,000	0	7,000
Phase 3 EP/Guidance EMD Contract		1QFY99					0	27,920	113,709	141,629
Phase 3 Follow on		2QFY03					0	0	116,817	116,817
<u>Support and Management Organizations</u>										
COEA Contractor Support	PO/MIPR	Jan 94			3,358					3,358
		Oct 95 -			9,896	2,607	2,790	2,691	17,955	35,939
	PR/REO	Mar 96								
JSP0 Operations	REO/MIPR	Oct 95 -			16,213	830	507	528	4,461	22,539
		Sep 96								
<u>Test and Evaluation Organizations</u>										
Government Test	PO/MIPR	Oct 95 -			29,437	1,077	3,527	6,476	32,038	68,555
		Sep 96								
*Note: Hughes became part of Raytheon Systems effective Dec 97.										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207163F Adv Med Range A/A Msl				PROJECT 3777	
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
None.									
<u>Support and Management Property</u>									
None.									
<u>Test and Evaluation Property</u>									
TM/ECM Pods	MIPR/PO			2,380	0	0	323	3,751	6,454
Subtotal Product Development				210,537	5,191	33,051	35,060	239,349	523,187
Subtotal Support and Management				29,467	3,436	3,297	3,219	22,415	61,835
Subtotal Test and Evaluation				31,817	1,077	3,527	6,799	35,789	79,009
Total Project				271,821	9,704	39,875	45,078	297,553	664,031

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207217F Podded Reconnaissance System (PRS)				PROJECT 4611		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
4611 Theater Airborne Reconnaissance System	6,127	282	0	0	0	0	0	0	9,409	
Quantity of RDT&E Articles	1/*	0	0	0	0	0	0	0	1/*	

* RDT&E articles are not seperately priced.

(U) A. Mission Description and Budget Item Justification

(U) The Theater Airborne Reconnaissance System (TARS) Podded Reconnaissance System (PRS) provides a responsive (on-demand), day/under-the-weather manned reconnaissance capability to support intelligence requirements of military, multinational, and other government agency users. It will provide literal, selective aspect electro-optical (EO) sensor imagery for bomb damage assessment. TARS will use on-board imagery recording and ground-based first phase imagery exploitation. It is intended to fill the penetrating, low altitude, under-the-weather medium-to-high threat niche not accomplished by current systems (national, UAVs, and other manned systems). TARS supports Combat Air Force (CAF) Mission Need Statement 328-93, Theater Airborne Reconnaissance System, 5 Jun 95.

(U) TARS will consist of 20 podded systems with embedded electro-optical (EO) sensor suites, provisions for a data link and a second sensor, five transportable Squadron Ground Systems (SGS), logistics support, and spares. It will be integrated into Air National Guard (ANG) Block 30 F-16C squadrons. Each TARS PRS system will provide a single forward/oblique EO sensor, sensor controller, wide-band recorder, second sensor window, and internal pod environmental control. The pod will interface with the F-16 cockpit Electronic Warfare Management System. The PRS will also provide space and environmental control required to implement a second vertical/oblique EO sensor and provisions for a P3I (Pre-Planned Product Improvement) Common Data Link. The SGS will interface with Combat Intelligence System (CIS) terminals.

(U) The TARS Program is in Budget Activity 7, Operational System Development. It involves commercial/government off-the-shelf technology and integration into operational (fielded) platforms.

(U) Acquisition Strategy: The acquisition strategy uses concurrent development/production and a firm fixed price contract. Aeronautical Systems Center (ASC), Wright-Patterson AFB, OH is the lead development activity. First year activities (FY 96) included contract award. Second year activities (FY 97) included completion of the Source Selection Process and a resulting Engineering Change Proposal to incorporate a new framing sensor, long lead item acquisition (pods, subsystem LRUs, etc.) and risk reduction to support first article development and procurement of production shipsets. Third year activities (FY 98) include first article testing, delivery of production systems, SGS segments, integration, and initiation of ANG unit activations. TARS will be Common Imagery Ground Surface System (CIGSS) and Common Data Link (CDL) compliant IAW Defense Airborne Reconnaissance Office guidelines.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0207217F Podded Reconnaissance System (PRS)	4611
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$30 Modeling and Simulation- (U) \$1,000 Flight Test- (U) \$4,527 NRE- (U) \$70 SEEK EAGLE Stores Certification- (U) \$160 Miscellaneous- (U) \$340 Program support- (U) \$6,127 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$140 Flight Test- (U) \$142 Program Support- (U) \$282 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$0 Total		
Project 4611	Page 2 of 6 Pages	Exhibit R-2 (PE 0207217F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207217F Podded Reconnaissance System (PRS)	PROJECT 4611
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Appn 3010, Initial Spares BP 16	0	0							1,700
(U) Appn 3010, Other Production Charges BP19	0	6,082							38,221

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>						
	1	2	3	4	1	2	3	4	1	2	3	4	
(U) Source Selection	*												
(U) Contract Award		*											
(U) Development Begins				*									
(U) Testing Begins				*									
(U) Begin Procurement				*									
(U) Mid-Bay Sensor Contract Award					X								
(U) Begin P ³ I Planning						X							
(U) Development Ends								X					
(U) Testing Ends								X					
(U) IOC								X					
(U) Procurement Ends												X	

* denotes completed events
X denotes planned events

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207217F Podded Reconnaissance System (PRS)	PROJECT 4611
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) SEEK EAGLE Stores Certification	70	0	
(U) Modeling and Simulation	30	0	
(U) Non-Recurring Engineering	4,527	0	
(U) Miscellaneous	160	0	
(U) Flight test	1,000	140	
(U) Program Support	340	142	
(U) Total	6,127	282	0

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207217F Podded Reconnaissance System (PRS)				PROJECT 4611	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
LMFS	FFP	27 Sep 96	7,337	7,337	2,810	4,527	0	0	0	7,337
DESC (ERIM M&S)	MIPR	8 Oct 96	130	130	100	30	0	0	0	130
EGLIN	AF 185	30 Jan 97	70	70	0	70	0	0	0	70
<u>Support and Management Organizations</u>										
SPO OVHD	Mission Spt	Misc	N/A	N/A	90	240	142	0	0	472
OO-ALC	AF 616	29 Aug 97	100	100	0	100	0	0	0	100
SPO Misc	Misc				0	160	0	0	0	160
<u>Test and Evaluation Organizations</u>										
AFFTC	AF 616	15 Apr 97	N/A	N/A	0	1,000	140	0	0	1,140
Government Furnished Property: Not Applicable										
Subtotal Product Development					2,910	4,627	0	0	0	7,537
Subtotal Support and Management					90	500	142	0	0	732
Subtotal Test and Evaluation					0	1,000	140	0	0	1,140
TOTAL					3,000	6,127	282	0	0	9,409
Project 4611					Page 6 of 6 Pages			Exhibit R-3 (PE 0207217F)		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207247F Air Force TENCAP	PROJECT 0001
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0001 Air Force TENCAP	18,172	14233	6447	10285	10102	11093	10825	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Air Force TENCAP is a Congressionally mandated program to provide the Tactical Exploitation of National Capabilities (TENCAP). The objective of TENCAP is to pursue seamless integration of present and future national space systems' capabilities into military operations for the warfighter. TENCAP expedites improvements to Air Force combat capabilities by performing operational concept demonstrations with rapid prototyping. TENCAP is not a developmental program per normal acquisition guidelines, but does support future operational systems development. To enhance combat effectiveness, TENCAP will focus in three areas:

- 1) Exploit existing national systems for the tactical warfighter (TENCAP will conceive and demonstrate capabilities to exploit national systems).
- 2) Influence the design and operation of new national systems for the warfighter by advocating tactical impacts of the new systems (in the form of analysis and integration of national systems into roadmaps and architectures for Air Force weapons/C⁴I systems).
- 3) Educate warfighters about national systems capabilities (in the form of training, exercises, and readiness activities).

Since this effort supports fielded systems, it is in the budget activity #7 Operational Systems Development.

(U) Acquisition Strategy. Not Applicable.

(U) FY 1997 (\$ in Thousands):

- (U) \$14,672 Exploited the tactical use of existing national systems for the warfighter
- --Talon Warrior (Supported training, exercises, and TENCAP applications)
- --Talon Ready (Supported mission planning)
- --Talon Shooter (Supported weapons delivery)
- --Talon Knight (Supported Special Operations)
- --Talon Command (Supported Air Force C2 systems)
- --Talon Vision (Supported emerging technologies and applications)
- (U) \$1,000 Transitioned TENCAP Concept Demonstrations to the field
- (U) \$2,500 Program support
- (U) \$18,172 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE		PROJECT	
7 - Operational System Development	0207247F Air Force TENCAP		0001	
<u>(U) FY 1998 (\$ in Thousands):</u>				
– (U) \$11,733	Exploit the tactical use of existing national systems for the warfighter			
–	--Talon Warrior (Support for training, exercises, and TENCAP applications)			
–	--Talon Ready (Support mission planning)			
–	--Talon Shooter (Support for weapons delivery)			
–	--Talon Knight (Support Special Operations)			
–	--Talon Command (Support for Air Force C2 systems)			
–	--Talon Vision (Support for emerging technologies and applications)			
– (U) \$700	Transition TENCAP Concept Demonstrations to field			
– (U) \$1800	Program support			
– (U) \$14,233	Total			
<u>(U) FY 1999 (\$ in Thousands):</u>				
– (U) \$ 4,747	Exploit the tactical use of existing national systems for the warfighter			
–	--Talon Warrior (Support for training, exercises, and TENCAP applications)			
–	--Talon Ready (Support mission planning)			
–	--Talon Shooter (Support for weapons delivery)			
–	--Talon Knight (Support Special Operations)			
–	--Talon Command (Support for Air Force C2 systems)			
–	--Talon Vision (Support for emerging technologies and applications)			
– (U) \$800	Transition TENCAP Concept Demonstrations to field			
– (U) \$900	Program support			
– (U) \$6,447	Total			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget FY1998	19,102	15,251	16,277	Continuing
(U) Appropriated Value	20,116	15,251		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-497	-646		
b. SBIR	-517	-372		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-900			
Project 0001	Page 2 of 4 Pages		Exhibit R-2 (PE 0207247F)	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207247F Air Force TENCAP			PROJECT 0001		
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
e. Rescission	-30								
(U) Adjustments to Budget Years Since FY1998 PB				-9830					
(U) Current Budget Submit (FY1999 President's Budget)	18,172	14,233	6447	Continuing					
(U) Change Summary Explanation:									
Funding: \$500K FY97 reprogramming funded classified program. \$400K FY97 reprogramming and FY99 reduction funds higher priority Air Force and DoD requirements.									
Schedule: None									
Technical: None									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement, BA 3, BPAC 2070	196	143	194	197	201	202	202	Cont	Cont
(U) D. <u>Schedule Profile:</u>									
	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	
Contractor Proposals for FY98 Projects			X						
FY98 Project Evaluations Complete				X					
FY98 Project Authority to Proceed				X					
FY99 Projects Identified					X				
FY99 Projects Evaluated and Approved					X				
FY99 Project Authority to Proceed					X				
FY00 Projects Identified							X		
FY00 Projects Evaluated and Approved								X	
FY00 Projects Authority to Proceed								X	
Project 0001									
Page 3 of 4 Pages									
Exhibit R-2 (PE 0207247F)									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998					
BUDGET ACTIVITY						PE NUMBER AND TITLE				PROJECT	
7 - Operational System Development						0207247F Air Force TENCAP				0001	
(U) A. <u>Project Cost Breakdown (\$ in Thousands):</u>											
						<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
TALON Projects						14,672	11,733	4,747			
Transition of Projects						1,000	700	800			
Program Management Spt						2,500	1,800	900			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
<u>Contractor or</u>	<u>Contract</u>										
<u>Government</u>	<u>Method/Type</u>	<u>Award or</u>	<u>Performing</u>	<u>Project</u>	<u>Total</u>						
<u>Performing</u>	<u>or Funding</u>	<u>Obligation</u>	<u>Activity</u>	<u>Office</u>	<u>Prior to</u>	<u>Budget</u>	<u>Budget</u>	<u>Budget</u>	<u>Budget to</u>	<u>Total</u>	
<u>Activity</u>	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>	
<u>Product Development Organizations:</u> None.											
<u>Support and Management Organizations:</u>											
Multiple	Various	Multiple			20,460	8,172	4,233	2,447	Cont	Cont	
Lockheed Martin	CPAF	Sep 95	Cont	Cont	0	10,000	10,000	4,000	Cont	Cont	
<u>Test and Evaluation Organizations:</u> None.											
Government Furnished Property: Not applicable. No Government property furnished to non-Government entities.											
Subtotal Product Development						0	0	0	0	0	0
Subtotal Support and Management						20,460	18,172	14,233	6,447	Cont	Cont
Subtotal Test and Evaluation						0	0	0	0	0	0
Total Project						20,460	18,172	14,233	6,447	Cont	Cont
Project 0001						<i>Page 4 of 4 Pages</i>			Exhibit R-3 (PE 0207247F)		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207268F Aircraft Engine Component Improvement Program (CIP)	PROJECT 1012
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1012 Aircraft Engine Component Improvement Program	92,636	98,058	92,069	93,659	116,663	115,259	114,560	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **Note:** Prior to FY97 this program was funded under Program Element 0604268F.

(U) **A. Mission Description and Budget Item Justification**

CIP provides critical sustaining engineering support (only source) for in-service Air Force engines to maintain flight safety (highest priority), to correct service revealed deficiencies, to improve system Operational Readiness (OR) and Reliability and Maintainability (R&M), to reduce engine Life Cycle Cost (LCC), and to sustain engines throughout their service life. Historically, aircraft systems change missions, tactics, and environments to meet changing threats throughout their lives. Numerous new problems can develop in the engines through actual use during deployment, production, and service, and CIP provides the only funds to develop fixes for these field problems. CIP starts with delivery of the first production engine purchased with procurement funds, and continues over the engine's life, gradually decreasing to a minimum level (safety/depot repairs) sufficient to keep older inventory engines operational. CIP addresses out-of-warranty usage and life and enables the Air Force to obtain additional warranties when manufacturers incorporate CIP improvements into production engines. Since operational and safety problems arise throughout a system's service life, CIP must be maintained at a level to provide the engineering support to make the changes essential for continued satisfactory system performance at affordable costs. CIP ensures continued improvements in engine R&M factors, which reduce outyear support costs. Historically, R&M related CIP efforts reduce outyear Operations and Maintenance (O&M) and spares costs by a ratio greater than 21 to 1. O&M and spares budgets assume a viable CIP effort is in place. Without the outyear cost avoidance provided by CIP, outyear support funding would have to be increased drastically. CIP funding is driven by field events and types/maturity of engines, not by the total engine quantity. This program is in budget activity 7 - Operational System Development, Research Category 6.6 because all efforts support fielded systems.

(U) **B. Acquisition Strategy**

Contracts within this Program Element are awarded sole source to engine manufacturers. CIP tasks are generally assigned to original engine manufacturers. Tasks are assigned based on available funding and prioritization of candidate tasks.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0207268F Aircraft Engine Component Improvement Program (CIP)	1012
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 83,400 636 CIP tasks (244 redesign tasks, 318 repair development tasks, and 74 analysis tasks) - (U) 5,198 6000 test hours - (U) 4,038 Petroleum, oil, lubricants and other support costs - (U) \$92,636 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 81,962 626 CIP tasks (250 redesign tasks, 302 repair development tasks, and 74 analysis tasks) - (U) 10,600 7250 test hours - (U) 5,496 Petroleum, oil, lubricants and other support costs - (U) \$98,058 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 75,391 590 CIP tasks (239 redesign tasks, 270 repair development tasks, and 81 analysis tasks) - (U) 8,648 6500 test hours - (U) 8,030 Petroleum, oil, lubricants and other support costs - (U) \$92,069 Total 		
Project 1012	Page 2 of 5 Pages	Exhibit R-2 (PE 0207268F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207268F Aircraft Engine Component Improvement Program (CIP)				PROJECT 1012		
<p>(U) A. Project Cost Breakdown (\$ in Thousands): A project cost breakdown is not applicable to this Program, because there are no individual projects, but several hundred independently managed tasks. The bulk of the funding goes to the major engine manufacturers. Cost breakdown for follow-on years is expected to be of similar proportions.</p>										
		<u>FY97</u>	<u>FY98</u>	<u>FY99</u>						
Contracted Tasks		83,400	81,962	75,391						
AFFTC Flight Tests		1,457	600	2,500						
AEDC Altitude Tests		3,741	10,000	6,148						
Petroleum/Oil/Lubricants		2,900	4,290	6,730						
Mission Support		1,138	1,206	1,300						
PE TOTAL		92,636	98,058	92,069						
<p>(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)</p>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
GE-Evandale, OH	CPAF	Jan 98	NA	NA	NA	37,820	\$43,668	\$35,954	CONT	CONT
Pratt & Whitney	CPAF	Jan 98	NA	NA	NA	36,087	31,874	29,215	CONT	CONT
GE-Lynn, MA	CPFF	Jan 98	NA	NA	NA	5,457	2,576	6,825	CONT	CONT
Allison	CPFF	Jan 98	NA	NA	NA	1,230	1,362	1,429	CONT	CONT
<p>Project 1012 Page 4 of 5 Pages Exhibit R-3 (PE 0207268F)</p>										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207268F Aircraft Engine Component Improvement Program (CIP)				PROJECT 1012	
<u>Product Development Organizations (Continued)</u>										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Teledyne	CPFF	Jan 98	NA	NA	NA	1,134	1,207	730	CONT	CONT
Allied Signal	CPFF	Jan 98	NA	NA	NA	560	500	538	CONT	CONT
Williams	CPFF	Jan 98	NA	NA	NA	601	275	200	CONT	CONT
Sundstrand	CPFF	Jan 98	NA	NA	NA	511	500	500	CONT	CONT
<u>Support and Management Organizations</u>										
In House Support					NA	1,138	1,206	1,300	CONT	CONT
Petroleum/Oil/Lubricants					NA	2,900	4,290	6,730	CONT	CONT
<u>Test and Evaluation Organizations</u>										
AFFTC-Edwards AFB, CA					NA	1,457	600	2,500	CONT	CONT
AEDC-Arnold AFB, TN					NA	3,741	10,000	6,148	CONT	CONT
Government Furnished Property: None										
Subtotal Product Development					NA	83,400	81,962	75,391	CONT	CONT
Subtotal Support and Management					NA	4,038	5,496	8,030	CONT	CONT
Subtotal Test and Evaluation					NA	5,198	10,600	8,648	CONT	CONT
Total Project					NA	\$92, 636	\$98,058	\$92,069	CONT	CONT

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207320F Sensor Fuzed Weapons	PROJECT 1016
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1016 Sensor Fuzed Weapon	18,664	16,437	3,551	0	0	0	0	0	48,169
Quantity of RDT&E Articles	4/\$1,600	4/\$1,600	0	0	0	0	0	0	8/3,200

(U) A. Mission Description and Budget Item Justification

This project continues development of the Sensor Fuzed Weapon (SFW) Pre-Planned Product Improvement (P3I). The P3I improvements to the baseline SFW will enhance weapon performance against primary targets (land combat vehicles), targets with countermeasures, and potentially allow for use against alternative targets. The improvements will also enhance the performance of SFW when fitted with the Wind Corrected Munitions Dispenser (WCMD) kit and the anti-armor version of the Joint Standoff Weapon (JSOW). This program is in budget activity 7 - Operational System Development, because this activity funds improvements to the SFW, which is currently in production. SFW is an ACAT 1C program.

(U) Acquisition Strategy:

The SFW Pre-Planned Product Improvements (P3I) program is a 40 month R&D effort to enhance the BLU-108 submunition and projectile. This is a sole source Cost-Plus Award Fee (CPAF) contract for P3I to the current SFW submunition design and for incorporating the P3I design into the FY 1999 full rate production contract.

(U) FY 1997 (\$ in Thousands):

- (U) 17,918 Continued the P3I development, qualification, integration of the dual mode sensor and multi-mission warhead
- (U) 66 GFE (PBX-11 explosive fill)
- (U) 186 Conducted Test Analysis
- (U) 494 Program management support, includes travel, program office supplies and equipment, training and technical engineering support
- (U) \$18,664 Total

(U) FY 1998 (\$ in Thousands):

- (U) 10,344 Continue the P3I development, qualification, integration of the dual mode sensor and multi-mission warhead. Conduct munition tests.
- (U) 4,981 Conduct dual mode sensor and multimission warhead tests
- (U) 1,112 Program management support, includes travel, program office supplies and equipment, training and technical engineering support
- (U) \$16,437 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207320F Sensor Fuzed Weapons	PROJECT 1016
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(U) **FY 1999 (\$ in Thousands):**

- (U) 1,040 Complete the P3I development program with contractor test and evaluation; integrate P3I into the production program
- (U) 451 Program management support, includes travel, program office supplies and equipment, training and technical engineering support
- (U) 2,060 Conduct and complete CBU flight tests
- (U) \$3,551 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	18,695	19,804	3,622	53,067
(U) Appropriated Value	19,100	19,804		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-400	-705		
b. SBIR	-5	-2,662		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-31			
(U) Adjustments to Budget Years Since FY 1998 PB			-71	
(U) Current Budget Submit/FY 1999 President's Budget	18,664	16,437	3,551	48,169

(U) Change Summary Explanation:

Funding: For the FY98 funds, \$420,000 is pending reprogramming to fund higher priorities and \$213,000 is pending for additional SBIR reduction.

Schedule: No Change

Technical: No Change

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207320F Sensor Fuzed Weapons	PROJECT 1016
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) SFW Production, Procurement of Ammo, AF (Appn 3011) ; PE 0207320F	149,500	150,150	125,992	151,804	118,039	109,163	189,000	240,021	1,724,621
(U) Total	149,500	150,150	125,992	151,804	118,039	109,163	189,000	240,021	1,724,621

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract Award (FY96/Q3)												
(U) System Requirement Review (SRR) (FY96/Q4)												
(U) System Design Meeting		*										
(U) Design and Development of P3I	*								X			
(U) Trade Studies	*			*								
(U) Preliminary Design Review (PDR)				*								
(U) Detailed Design/Development Tests	*								X			
(U) Development Test Meeting						X						
(U) Critical Design Review (CDR)									X			
(U) Hardware Build/Qualification Tests									X			
(U) CBU Flight Tests									X	X		
(U) P3I ECP/FY99 Prod Contract Awrd									X			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207320F Sensor Fuzed Weapons			PROJECT 1016		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Major Contracts					17,918	10,344	1,040			
(U) Support Contracts					317	587	177			
(U) Program Office Support					177	525	274			
(U) Test and Evaluation					186	4,981	2,060			
(U) Government Furnished Equipment (GFE)					66	0	0			
(U) Total					18,664	16,437	3,551			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Textron System Defense	CPAF	Oct 98	36,961	36,961	7,659	17,918	10,344	1,040	0	36,961
<u>Support and Management Organizations</u>										
ASC/YH	N/A	varius	N/A	N/A	84	177	587	177	0	1,025
Miscellaneous	CPAF	varius	N/A	N/A	0	317	525	274	0	1,116
<u>Test and Evaluation Organizations</u>										
46 OG/OGML	REO	Oct 98	N/A	N/A	1,774	186	4,981	2,060	0	9,001
Project 1016					Page 4 of 5 Pages			Exhibit R-3 (PE 0207320F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207320F Sensor Fuzed Weapons				PROJECT 1016	
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
GFE (PBX-11) Army, Aberdeen	MIPR	May 97	Oct 97	0	66	0	0	0	66
<u>Support and Management Property</u>									
None									
<u>Test and Evaluation Property</u>									
None									
Subtotal Product Development				7,659	17,984	10,344	1,040	0	37,027
Subtotal Support and Management				84	494	1,112	451	0	2,141
Subtotal Test and Evaluation				1,774	186	4,981	2,060	0	9,001
Total Project				9,517	18,664	16,437	3,551	0	48,169

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207325F Joint Air-to-Surface Standoff Missile	PROJECT 4515
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4515 Joint Air-to-Surface Standoff Missile (JASSM)	160,692	123,460	132,870	104,434	34,067	4,913	0	0	588,036
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) In FY 1998, \$40,622 (after Congressional reductions) was appropriated in the JSLAM PE (64611F). Pending SecDef decision, funding may be executed by either JASSM or JSLAM.

(U) * NOTE: Cost information is Source Selection Sensitive because of the competitive nature of the contract effort. This information is available through AFPEO/WP.

(U) A. Mission Description and Budget Item Justification

The Joint Air-to-Surface Standoff Missile (JASSM) is a joint Air Force/Navy program with the Air Force as the lead service. This is an ACAT ID program to provide an affordable long range, conventional air-to-surface, autonomous precision guided, standoff cruise missile compatible with fighter and bomber aircraft and able to attack a variety of fixed or relocatable targets. Initial integration efforts are for the B-52H, F-16 Block 50 and F/A-18E/F. Objective aircraft include the B-1, B-2, F-15E, F-16 Block 40, F-117, P-3 and S-3. This descriptive summary reflects Air Force only funding. Although reflected in Budget Activity 7, Operational System Development, the program is currently in Budget Activity 5, Engineering and Manufacturing Development because its products are primarily research and development procured through advanced acquisition reform methods.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded through full and open competition. JASSM is an OSD flagship program under Cost as An Independent Variable (CAIV). This allows for competing contractors to have maximum trade space to develop an affordable missile that meets the three key performance parameters. Under CAIV, the program maintains a threshold unit cost of \$700 (BY \$95) and an objective unit cost of \$400 (BY \$95). JSLAM funds will be distributed in accordance with Congressional direction based on the results of the Analysis of Alternatives and SecDef determination.

(U) FY 1997 (\$ in Thousands):

- (U) \$131,543 Continued two selected PDRR contractors for JASSM weapon system development and hardware
- (U) \$ 11,611 Continued aircraft integration.
- (U) \$ 6,707 Continued flight test support for threshold aircraft, aircraft modifications, live fire test support, target construction.
- (U) \$ 7,839 Continue program office support contracts.
- (U) \$ 2,992 Continue mission support.
- (U) \$160,692 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207325F Joint Air-to-Surface Standoff Missile	PROJECT 4515																																																							
<p>(U) FY 1998 (\$ in Thousands): NOTE: Amounts reflected below fund efforts through approximately 30 April 1998. Pending SecDef decision, JSLAM funding (\$40,622) could be made available for PDRR Phase II.</p> <ul style="list-style-type: none"> - (U) \$ 90,096 Continue PDRR Phase I contractors for JASSM through downselect. - (U) \$ 13,154 Continue flight test support, aircraft modifications, live fire test support, target construction/rehab. - (U) \$ 11,450 Continue aircraft integration. - (U) \$ 5,677 Continue program support contracts. - (U) \$ 2,083 Continue mission support. - (U) \$ 1,000 Congressionally-directed alternate engine source study - (U) \$123,460 Total <p>(U) FY 1999 (\$ in Thousands):</p> <ul style="list-style-type: none"> - (U) \$ 68,873 Initiate EMD. - (U) \$ 40,643 Continue flight test support, aircraft modifications, live fire test support, target construction/rehab. - (U) \$ 10,931 Continue aircraft integration. - (U) \$ 10,523 Continue program support contracts. - (U) \$ 1,900 Continue mission support. - (U) \$132,870 Total <p>(U) B. Program Change Summary (\$ in Thousands)</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget FY 1998 PB</td> <td style="text-align: right;">160,958</td> <td style="text-align: right;">203,321</td> <td style="text-align: right;">135,542</td> <td style="text-align: right;">588,036</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">168,632</td> <td style="text-align: right;">128,000</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional Reductions</td> <td style="text-align: right;">-3,551</td> <td style="text-align: right;">-4,540</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-4,123</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: right;">-266</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-2,672</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">160,692</td> <td style="text-align: right;">123,460</td> <td style="text-align: right;">132,870</td> <td style="text-align: right;">588,036</td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget FY 1998 PB	160,958	203,321	135,542	588,036	(U) Appropriated Value	168,632	128,000			(U) Adjustments to Appropriated Value					a. Congressional Reductions	-3,551	-4,540			b. SBIR	-4,123				c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions	-266				(U) Adjustments to Budget Years Since FY 1998 PB			-2,672		(U) Current Budget Submit/FY 1999 President's Budget	160,692	123,460	132,870	588,036
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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(U) Current Budget Submit/FY 1999 President's Budget	160,692	123,460	132,870	588,036																																																					
Project 4515	Page 2 of 7 Pages	Exhibit R-2 (PE 0207325F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207325F Joint Air-to-Surface Standoff Missile	PROJECT 4515
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(U) Change Summary Explanation:

Funding: FY 1998 reduced by \$75,321 (\$32,300 eliminated from JASSM PE, \$43,021 allocated to new JSLAM PE). JSLAM assessed proportional amounts of Congressional general reductions of \$2,399 leaving \$40,622. FY99 funding reflects inflation adjustments.

Schedule: FY98 Congressional RDT&E reduction (\$32,300) drove program re-structure: PDRR now in two phases [competitive Phase I, June 1996 to April 1998; downselect to one contractor for Phase II, April 1998 (was July 1998)]; EMD start in November 1998 (was July 1998); Milestone II now September 1998 (was June 1998).

Technical: No change.

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Missile Procurement	0	0	0	75,044	74,333	153,996	203,825	1,172,377	1,679,575
(U) Seek Eagle	0	0	0	8,002	2,291	10,200	0	0	20,493

Related RDT&E:

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) RDT&E PE 604611F, Joint Standoff Land Attack Missile (JSLAM)	0	40,622	0	0	0	0	0	0	40.622

(NOTE: Pending completion of Analysis of Alternatives, funding may be executed by JASSM or JSLAM.)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207325F Joint Air-to-Surface Standoff Missile	PROJECT 4515
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Downselect to Single Contractor									X			
(U) PDRR Phase I Completion									X			
(U) PDRR Phase II Start									X			
(U) Milestone II Approval								X				
(U) PDRR Phase II Completion										X		
(U) EMD Contract Award / Start										X		
(U) DT&E Start										X		
(U) B-52H Wind Tunnel Test			X									
(U) F-16 C/D Wind Tunnel Test			X									
(U) B-52H Software Dev/Test Start						X						
(U) F-16 C/D Software Dev/Test Start						X						
(U) F-16 C/D Software Dev/Test Completion								X				
(U) F-16 C/D Ground & Flight Test Start								X				
(U) B-52H Software Dev/Test Completion										X		
(U) B-52H Ground & Flight Test Start											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207325F Joint Air-to-Surface Standoff Missile	PROJECT 4515
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Major Contracts	131,543	90,096	68,873
(U) Associated Contracts	11,611	11,450	10,931
(U) Support Contracts	7,839	5,677	10,523
(U) In-House	2,992	2,083	1,900
(U) Test Support	6,707	13,154	40,643
(U) Congressionally-directed alternate engine source study		1,000	
(U) Total	160,692	123,460	132,870

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207325F Joint Air-to-Surface Standoff Missile				PROJECT 4515	
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
JASSM Development Contractors	C/CPFF/CPIF	Jun 96	**	**	18,637	131,543	90,096	68,873	73,474	382,623
**Note: Contract cost information is Source Selection Sensitive because of the competitive nature of the contract effort. This information is available through AFPEO/WP.										
<u>Support and Management Organizations</u>										
F-16 SPO	PO	Apr 96	N/A	N/A	210	1,853	2,600	2,000	21,906	28,569
B-52 SPO	PO	Sep 96	N/A	N/A	1,500	7,053	7,400	5,500	2,000	23,453
Other Acft SPOs	PO	Various	N/A	N/A	488	2,705	1,450	0	0	4,643
Sverdrup Tech Inc.	C/CPAF	Jan 96	N/A	N/A	1,097	2,277	2,948	2,387	3,257	11,966
Navy	MIPR	Jan 96	N/A	N/A	808	1,424	287	0	0	2,519
JASSM SPO/Other	Misc	Various	N/A	N/A	3,906	7,130	5,525	13,467	5,714	35,742
<u>Test and Evaluation Organizations</u>										
46TW	PO	Jan 96	N/A	N/A	954	6,707	13,154	40,643	37,063	98,521

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207412F Theater Air Control System	PROJECT 485L
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
485L Theater Air Control Sys Imp (TACSI)	589	393	440	487	471	460	451	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification:

Ground Theater Air Control System (GTACS) provides the means through which the Air Component Commander exercises control of his forces to accomplish his assigned mission. This program provides for major improvements to the existing Tactical Air Control System (TACS) which was designed in the 1960s and is now unsupportable. The GTACS RDT&E program consists primarily of the Modular Control Equipment (MCE) Pre-Planned Product Improvements (P3I) program which replaces obsolete equipment (operator consoles, shelters, computers, radios, etc.) in the GTACS. The modernization upgrades C2 interoperability, flexibility, mobility, communications and worldwide operations. The P3I program is structured into multiple phases. Phase one consisted of the integration of secure anti-jam UHF radios, an upgrade to the weapons control and Joint Tactical Air Operations data link software (S/W). These improvements have already been incorporated into the MCE production line. The current R&D includes the integration of a Joint Tactical Information Distribution System (JTIDS)/Tactical Digital Information Link-J (TADIL-J) capability, the integration of an Automated Air Tasking Order (AATO) capability, integration of secure anti-jam VHF (SINCGARS) radios and upgrades to the Ground Mobile Forces/Satellite Communications digital communications interfaces. This program also includes production funding for JTIDS terminals, JTIDS Modules (JMs), JTIDS Interface Boxes (JIBs) and Operations Modules (OM) Interface Kits, all of which are required to integrate JTIDS/COMM into the MCE. The next planned phase includes a software interoperability upgrade to the TADIL-J Reissue 2 baseline, which works towards a Theater Missile Defense capability and the implementation of the Interim JTIDS Message Specification. This program is in budget activity 7 - Operational System Development because the Ground Theater Air Control System (GTACS) is a fielded, operational system currently undergoing major modifications/upgrades.

(U) Acquisition Strategy:

MCE OM development is complete, production is ongoing until fourth quarter, FY99. Current strategy is to develop and define requirements for the GTACS follow-on system, migrating to a Global Command and Control System (GCCS) platform. Further strategy is to work the residual tasks associated with the MCE OM production item.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207412F Theater Air Control System	PROJECT 485L
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- (U) FY 1997** (\$ in Thousands)
 - (U) 274 Continued development/fielding of interoperability upgrades to MCE P3I system
 - (U) 100 Continued operator and maintainer training
 - (U) 215 Continued program support, test, and other miscellaneous efforts
 - (U) 589 Total

- (U) FY 1998** (\$ in Thousands)
 - (U) 130 Continue development/fielding of interoperability upgrades to MCE P3I systems
 - (U) 60 Continue development of follow-on system for migration to the Air Force GCCS
 - (U) 187 Continue program support, test, and other miscellaneous efforts
 - (U) 377 Total

- (U) FY 1999** (\$ in Thousands)
 - (U) 160 Continue development/fielding of interoperability upgrades to MCE P3I systems
 - (U) 40 Continue development of follow-on system for migration to the Air Force GCCS
 - (U) 231 Continue program support, test, and other miscellaneous efforts
 - (U) 431 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207412F Theater Air Control System	PROJECT 485L
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B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	590	393	440	TBD
(U) Appropriated Value	622	393		
(U) Adjustments to Appropriated Value				
a. General Congressional Reductions	-20	-13		
b. SBIR	-12	-3		
c. Omnibus / Other Above Threshold Reprogramming				
d. Below Threshold Reprogramming				
e. Rescissions	-1			
(U) Adjustments to Budget since FY98 PB			-9	
(U) Current Budget Submission/FY 1999 President's Budget	589	377	431	TBD

(U) Change Summary Explanation:

Funding:

FY97: -\$12 for Appr Act Sec 8136, -\$1 for Section 8138, -\$7 for Section 8037(E).

FY99: -\$9 funding has been realigned to support other Air Force priorities

Schedule: None

Technical: None

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207412F Theater Air Control System	PROJECT 485L
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) Other Procurement AF Total	9,441	27,434	26,064	24,199	19,149	19,999	19,988	Cont	TBD
Budget Activity 3, WSC 833040	4,149	22,252	20,813	19,545	19,149	19,555	19,554	Cont	TBD
Budget Activity 3, WSC 834010	0	0	0	0	0	0	0	0	3,020
Budget Activity 3, WSC 83790A	0	0	0	0	0	0	0	0	2,730
Budget Activity 6, WSC 838010	0	0	1,937	2,408	0	0	0	TBD	TBD
Budget Activity 4, WSC 84590A	0	0	0	0	0	0	0	0	6,166
Budget Activity 6, WSC 86190A	5,292	5,182	3,314	2,246	0	444	434	Cont	TBD

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) MCE P3I OM Interface Kit Follow-on Production Award					x				x			
(U) MCE P3I OM Interface Kit Article IOT&E			x			x						
(U) MCE P3I Initial Operational Capability (IOC)											x	
(U) JM Development Completed				x								
(U) GTACS Modernization					x				x			
(U) GCCS Migration					x				x			
(U) Program Support	x				x				x			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998	
BUDGET ACTIVITY	PE NUMBER AND TITLE		PROJECT
7 - Operational System Development	0207412F Theater Air Control System		485L
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Continue development fielding of interoperability upgrades to MCE P3I system	274	130	160
(U) Operator and maintainer training	100	0	0
(U) Develop follow-on system for migration to GCCS	0	60	40
(U) Program Management Support	215	187	231
(U) Total	589	377	431
Project 485L			
Page 5 of 7 Pages			
Exhibit R-3 (PE 0207412F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207412F Theater Air Control System			PROJECT 485L		
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>									
Performing Organizations:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>									
N/A									
<u>Support and Management Organizations</u>									
Computer Support					22	13	13		
Equipment Maintenance					6	6	6		
Miscellaneous (TDY, Supplies, Eq Purchase)					561	358	412		
<u>Test and Evaluation Organizations</u>									
N/A									
Project 485L			Page 6 of 7 Pages			Exhibit R-3 (PE 0207412F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT	
7 - Operational System Development	0207412F Theater Air Control System	485L	
Government Furnished Property: None			
Subtotal Product Development			
Subtotal Support and Management	589	377	431
Subtotal Test and Evaluation			
Total Project	589	377	431

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207414F Combat Intelligence System	PROJECT 4773
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4773 Combat Intelligence System (CIS)	0	11,590	9,802	10,172	9,009	7,523	6,625	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) Note: This funding request was previously programmed across PEs 0604321F, 0207431F, and 0305158F. They have been consolidated here in PE 0207414F for program clarity and reporting efficiency.

(U) A. Mission Description and Budget Item Justification

(U) Combat Intelligence System (CIS) is the Air Force's single, standard automated intelligence system optimizing both component and unit-level intelligence functions to provide warfighters with the most accurate and timely intelligence data available. CIS is the core capability for automating the receipt, correlation, and dissemination of intelligence information to a variety of intelligence and operational systems which support combat planning and execution. As the intelligence segment to Theater Battle Management Core Systems (TBMCS), it provides an automated capability at the component and unit levels to rapidly receive and process all-source intelligence data to support Contingency Theater Automated Planning System (CTAPS). CIS builds and maintains in-theater situational awareness during deployment to the theater and provides indications and warning support after arrival. CIS is electronically interoperable and compatible with other intelligence systems, providing an integrated network capable of intelligence support to decision makers, battle planners, mission planners, and warfighters. This program is in budget activity 5, Engineering and Manufacturing Development, because it develops new capabilities to upgrade current systems.

(U) **Acquisition Strategy:** Full and open competition has led to a cost plus award fee contract with Lockheed Martin Command and Control Systems (Colorado Springs, CO) to develop capabilities and integrate this system and software.

(U) **FY 1997:** Included in PEs 0604321F, 0207431F, and 0305158F.

(U) **FY 1998**

- (U) \$10,167 Complete software development for TBMCS Version 1.0 release, and initiate TBMCS software Version 2.0 development
- (U) \$ 900 Implement results of studies for CIS Intelligence Interoperability
- (U) \$ 523 System engineering and support
- (U) **\$11,590 Total**

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998																																													
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207414F Combat Intelligence System		PROJECT 4773																																													
<p>(U) <u>FY 1999</u></p> <ul style="list-style-type: none"> - (U) \$ 6,276 Continue software development for TBMCS V2.0 release - (U) \$ 3,138 Intiate TBMCS software version 3.0 planning and design - (U) \$ 388 Continue studies for CIS Intelligence Interoperability - (U) \$ 9,802 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">12,267</td> <td style="text-align: center;">10,499</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">0</td> <td style="text-align: center;">12,267</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td></td> <td style="text-align: center;">-425</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. Small Business Innovative Research</td> <td></td> <td style="text-align: center;">-252</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus/Other Above Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-697</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/ FY 1999 President's Budget</td> <td style="text-align: center;">0*</td> <td style="text-align: center;">**11,590</td> <td style="text-align: center;">**9,802</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: * FY97: Funding was appropriated in PEs 0604321F, 0207431F, and 0305158F. ** FY98 and FY99: Funds were budgeted in PEs 0604321F, 0207431F, and 0305158. They have been consolidated for clarity and reporting efficiency. FY98 is in BA6-EMD.</p> <p style="padding-left: 40px;">Schedule: Not Applicable</p> <p style="padding-left: 40px;">Technical: Not Applicable</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	0	12,267	10,499	TBD	(U) Appropriated Value	0	12,267			(U) Adjustments to Appropriated Value					a. Cong Reductions		-425			b. Small Business Innovative Research		-252			c. Omnibus/Other Above Threshold Reprogramming					(U) Adjustments to Budget Years Since FY 1998 PB			-697		(U) Current Budget Submit/ FY 1999 President's Budget	0*	**11,590	**9,802	TBD
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																												
(U) Previous President's Budget (FY 1998 PB)	0	12,267	10,499	TBD																																												
(U) Appropriated Value	0	12,267																																														
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(U) Adjustments to Budget Years Since FY 1998 PB			-697																																													
(U) Current Budget Submit/ FY 1999 President's Budget	0*	**11,590	**9,802	TBD																																												
Project 4773	Page 2 of 5 Pages		Exhibit R-2 (PE 0207414F)																																													

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207414F Combat Intelligence System				PROJECT 4773	
(U) C. Other Program Funding Summary (\$ in Thousands)									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Complete</u>	Total <u>Cost</u>
(U) Other Procurement AF, Budget Activity 5, Project 642758, PE 0207414F	9,705	18,043	12,819	18,149	14,107	11,587	11,582	Cont	TBD
(U) Other Procurement AF, Budget Activity 7, Project 671004, PE 0207431F	4,293	5,487	4,886	6,666	5,189	4,813	4,829	Cont	TBD
(U) Other Procurement AF, Budget Activity 7, Project 674395, PE 0305158F	1,951	0	0	0	0	0	0	0	2,919
(U) O&M, PE 0207431, CAIS	3,479	3,330	3,353	4,326	5,371	5,488	5,615	Cont	TBD
Related RDT&E									
(U) RDT&E, PE 0207431F, CAIS	7,373	0	0	0	0	0	0	0	7,373
(U) RDT&E, PE 0305158F, Project 4394	1,949	0	0	0	0	0	0	0	3,939
(U) RDT&E, PE 0604321F, CIS-EMD	2,786	0	0	0	0	0	0	0	16,443
(U) D. Schedule Profile									
		<u>FY 1997</u>			<u>FY 1998</u>		<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	
(U) CIS 1.2 Release			X						
(U) TBMCS V1.0 Preliminary Design Review (PDR)	X								
(U) TBMCS V1.0 In Plant Test					X				
(U) TBMCS V1.0 Release						X			
(U) TBMCS V2.0 PDR							X		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207414F Combat Intelligence System				PROJECT 4773		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Software Development					0	11,067	9,414			
(U) Engineering Support					0	523	388			
(U) Total					0	11,590	9,802			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Lockheed Martin Cmd & Ctrl Systems	SS/CPAF	Oct 95	TBD	TBD	0	0	11,067	9,414	Cont.	TBD
<u>Support and Management Organizations</u>										
TEMS	Time & Mtrls	Various	n/a	TBD	0	0	200	188	Cont.	TBD
MITRE	Fixed Price	Various	n/a	TBD	0	0	223	200	Cont.	TBD
<u>Test and Evaluation Organizations</u> - Not Applicable										
Test Support	Project Order	Various	n/a	TBD	0	0	100	0	Cont.	TBD
Government Furnished Property: Not Applicable										
Project 4773				Page 4 of 5 Pages			Exhibit R-3 (PE 0207414F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207414F Combat Intelligence System	PROJECT 4773
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
Subtotal Product Development	0	0	11,067	9,414	Cont.	TBD
Subtotal Support and Management	0	0	423	388	Cont.	TBD
Subtotal Test and Evaluation	0	0	100	0	Cont.	TBD
Total Project	0	0	11,590	9,802	Cont.	TBD

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207417F Airborne Warning & Control System (AWACS)	PROJECT 411L
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
411L Airborne Warning & Control System (AWACS)	55,005	43,606	28,189	26,015	36,423	22,375	58,965	TBD	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program develops and integrates system improvements which enable the E-3 AWACS to remain an effective, survivable airborne surveillance system for command and control of tactical forces and for strategic defense of the U.S. These improvements include Electronic Support Measures (ESM), Central Computer Memory Upgrade, Joint Tactical Information Distribution System (JTIDS) Class 2H/TADIL J and NAVSTAR Global Positioning System (GPS) integrated navigation (GINS) (collectively known as Block 30/35); the Radar System Improvement Program (RSIP); **the Computers and Displays (C&D) upgrade (an Extend Sentry effort) ; Cruise Missile Defense and various concept exploration and program definition/risk reduction efforts such as DII-GCCS compliance and incremental plug-and-play software upgrades through spiral development.** RSIP will increase radar reliability and maintainability, restore required E-3 surveillance capability against the evolving threats posed by low radar cross section fighters and cruise missiles, improve electronic counter countermeasures (ECCM), and enhance man-machine interface, **while** Extend Sentry is a collection of **58** projects that target investment in three areas. Extend Sentry prevents grounding of aircraft, buys back aircraft from maintenance downtime, and corrects deficiencies to meet operational requirements. **Only the C&D project is currently funded.** Test System 3 (TS-3)/AWACS Development and Production Tests (ADAPT) Support - includes maintenance for the government owned test aircraft and labs located at the contractor's facility. Category of research: Operational Systems Development, Budget Activity 7. AWACS is a fielded, operational system currently undergoing major modifications/block upgrades/continuing sustainment.

(U) Acquisition Strategy:

Block 30/35: ESM is joint development with NATO. Priced FPIF options with Boeing for ESM and 30/35 Group A hardware. CC-2E contract with LORAL Federal Systems with fixed price options. JTIDS and GPS acquired via respective program office-awarded contracts. RSIP is a cooperative development with NATO. Boeing is prime integrating contractor, **Northrup-Grumman** is the subcontractor for radar equipment items. FFP contract **with priced options through FY99** is sole source to Boeing for production. Extend Sentry acquisition strategy approved, contract vehicle awarded, and tasks **added as funding is made available.**

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207417F Airborne Warning & Control System (AWACS)	PROJECT 411L
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 105 Blk 30/35 EMD contract close out actions. - (U) \$27,540 Computers & Displays and Extend Sentry efforts - (U) \$ 8,406 Offensive Counter Air (OCA) efforts. - (U) \$18,954 AWACS Development and Production Tests (ADAPT) support and program sustaining efforts - (U) \$55,005 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$14,573 Computers & Displays and Extend Sentry efforts - (U) \$13,174 Cruise Missile Defense - (U) \$15,859 ADAPT support and program sustaining efforts - (U) \$43,606 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 5,944 Systems Architect - (U) \$7,500 Cruise Missile Defense - (U) \$14,745 ADAPT support and program sustaining efforts - (U) \$28,189 Total 		
Project 411L	Page 2 of 7 Pages	Exhibit R-2 (PE 0207417F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)						DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development			PE NUMBER AND TITLE 0207417F Airborne Warning & Control System (AWACS)			PROJECT 411L		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>								
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>				
				<u>Cost</u>				
(U) Previous President's Budget (FY 1998 PB)	78,635	46,807	29,266		TBD			
(U) Appropriated Value	82,559	46,807						
(U) Adjustments to Appropriated Value								
a. Congressional General Reductions	(1,929)	(2,038)						
b. SBIR	(1,995)	(1,163)						
c. Omnibus or Other Above Threshold Reprogram	(11,000)							
d. Below Threshold Reprogramming								
e. Rescissions	(12,630)							
(U) Adjustments to Budget Since FY98 PB			(1,077)					
(U) Current Budget Submit/FY 1999 President's Budget	55,005	43,606	28,189		TBD			
(U) Change Summary Explanation:								
Funding:								
FY97: Appropriations Act included a \$25M add to begin an E-3 re-engining program of this 1.4 went towards Congressional general reductions, 12.630 was rescinded by Congress and 11.000 was reprogrammed for OMNIBUS.								
FY98: \$297K of the total \$43.606M is on withhold pending reprogramming for higher priorities.								
FY99: 1.077M reduction reflects internal inflation adjustment.								
Schedule: None.								
Technical: None.								
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>								
	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total</u>
(U) Aircraft Procurement, AF,BA-5 AWACS Mod	127,652	114,181	97,869	105,423	65,980	88,173	Cont	TBD
(U) Other Procurement, AF	0	2,627	0	0	0	0	Cont	TBD

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207417F Airborne Warning & Control System (AWACS)	PROJECT 411L
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(U) D. Schedule Profile	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) RSIP IOT & E Complete				*								
(U) RSIP MSIII Decision				*								
(U) RSIP Trial Install Start										X		
(U) RSIP RAA 3QTR FY00												
(U) RSIP KIT DELIVERY (#1)						X						
(U) RSIP KIT DELIVERY (#2)										X		
(U) RSIP KIT DELIVERY (#3)											X	
(U) RSIP KIT DELIVERY (#4)												X
(U) RSIP KIT DELIVERY (#5) 1QTR FY00												
(U) BLK 30/35 Support capability - I Level				*								
(U) - D Level										X		
(U) BLK 30/35 RAA						X						
(U) BLK 30/35 IOC						X						

* Denotes completed events
X Denotes planned events

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207417F Airborne Warning & Control System (AWACS)	PROJECT 411L

(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Contracts	47,513	39,562	25,914
(U) MITRE/TEMS	5,318	2,947	1,670
(U) GFE	250		
(U) Travel	982	305	310
(U) Other	942	792	295
(U) Total	55,005	43,606	28,189

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207417F Airborne Warning & Control System (AWACS)			PROJECT 411L	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>									
Performing Organizations:									
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Total Program
<u>Product Development Organizations</u>									
(U) Boeing(RSIP)	C/FPIF	9/89	88,500	93,517	93,517	0	0	0	93,517**
(U) WECO(RSIP)	C/FPIF	9/89	327,400	306,900	259,155	0	0	0	259,155**
(U) Boeing(Blk 30/35)	SS/FPIF	5/87	N/A	N/A	291,667	105	0		291,772**
(U) Extend Sentry / Systems Architect	Multiple	N/A*	N/A	N/A	15,734	27,540	14,573	5,944	TBD
(U) Offensive Counter Air/CMD	Studies	N/A	N/A	N/A	29,368	8,406	13,174	7,500	TBD
* N/A based on Extend Sentry Acquisition Strategy which includes multiple contracts with multiple organizations with overlapping and continuing performance periods.									
** Total Program does not include NATO funds and covers contract plus ECPs.									
<u>Support and Management Organizations</u>									
(U) Support/TEMS MITRE/GFE, Travel & Other					553,227	7,492	4,044	2,275	TBD
<u>Test and Evaluation Organizations</u>									
(U) Test System-3 ADAPT Contract/ Other test Activities					33,800	11,462	11,815	12,470	TBD
Project 411L		Page 6 of 7 Pages				Exhibit R-3 (PE 0207417F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207417F Airborne Warning & Control System (AWACS)	PROJECT 411L
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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Total Program
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: None

	Total Prior to FY97	Budget FY 1997	Budget FY 1998	Budget FY 1999	Total Program
Subtotal Product Development	689,441	36,051	27,747	13,444	TBD
Subtotal Support and Management	553,227	7,492	4,044	2,275	TBD
Subtotal Test and Evaluation	33,800	11,462	11,815	12,470	TBD
Total Project	1,276,468	55,005	43,606	28,189	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Advanced Communications Systems
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	1,646	2,728	2,348	2,916	2,947	2,991	3,047	Continuing	TBD
1013 Theater Deployable Communications (TDC)	1,450	2,539	2,131	2,694	2,723	2,991	3,047	Continuing	TBD
2982 Anti-Jam Radio Communications	196	189	217	222	224	0	0	0	20,121
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Descriptions and Budget Item Justification

The Advanced Communication Systems program procures commercially available ground communications equipment for deployment to theaters of operation and develops and procures jam resistant ultra high frequency (UHF) and very high frequency (VHF) frequency-hopping tactical radios. The HAVE QUICK UHF radios provide the primary Air Force and DOD UHF Electronic Counter-Countermeasures (ECCM) voice communications. SINCGARS (Single Channel Ground and Airborne Radio System) provides anti-jam, VHF frequency-hopping voice and data communications and is the primary means of ECCM communications between Air Force, Army, and USMC aircraft and ground units involved in close air support and joint battlefield operations. The Theater Deployable Communications (TDC) program provides funding for the research, development, test and evaluation for the modernization of operational deployable communications, and integration of COTS equipment that support tactical air operations in a combat environment. This includes the integration of deployable communications equipment for active duty, guard and reserve forces. Equipment will be fielded at wings, combat communications squadrons, AFSOC and AMC communication units and Theater Air Control System units. RDT&E funds in this program element are used to examine appropriate emerging technologies; provide software development support for the fielded HAVE QUICK family of radios; and determine and resolve integration issues pertaining to commercial-off-the-shelf (COTS) equipment, making this program budget activity 7, Operational System Development.

(U) Acquisition Strategy: There are three (3) contracts within this Program Element; two contracts for TDC (the Lightweight Multiband Satellite Terminals (LMST) and the Integrated Communication Access Packages (ICAP)), and one for PACER SPEAK. All contracts within this Program Element are firm fixed price (FFP) and were awarded after full open competition. (When restricted technologies are involved, foreign competition is not allowed.)

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Advanced Communications Systems
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Previous President's Budget (FY1998 PB)	1,646	2,966	2,895
(U) Appropriated Value	1,822	2,966	
(U) Adjustments to Appropriated Value			
a. Congressional Reductions	-137	-174	
b. Small Business Innovative Research	-39	-64	
c. Omnibus and Other AboveThreshold Reprogramming			
d. Below Threshold Reprogramming			
e. Rescissions			
Adjustment to Budget Years Since FY 1998 President Budget			-547
(U) Current Budget Submit /FY 1999 President's Budget	1,646	2,728	2,348

(U) Change Summary Explanation:

Funding: N/A

Schedule: N/A

Technical: N/A

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Advanced Communications Systems
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837100, PE 0207423F	62,471	32,685	31,064	30,726	86,551	89,917	139,685	Cont.	TBD
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837290, PE 0207423F	2,270	3,844	2,518	2,330	2,115	104	104	0	8,478
(U) Aircraft Procurement AF, Budget Activity 5, Weapon System Code OTHACF, PE 0207423F	352	0	0	0	0	0	0	0	22,227
(U) Operations and Maintenance AF, PE 0207422F	1,438	2,155	3,124	4,168	5,238	5,336	5,438	Cont.	
(U) Operational and Maintenance AF PE 0207423F									TBD

Other Advanced Communication Systems Programs

- **PACER SPEAK** Operates the Air Force Air Request Net (AFARN), which is the principal means of communications through which theater forces plan, request, coordinate, and control immediate close air support (CAS), reconnaissance, and airlift requests. The AFARN is operated by the Tactical Air Control Parties (TACPs).
- **HAVE QUICK** Frequency-hopping UHF radio that provides jam-resistant voice and data communications.
- **SINGARS** Secure, jam-resistant VHF frequency-hopping voice and data communications system that can be configured in ground and airborne modes.
- **Digital Communications Terminal (DCT)** The DCT is used for message generation and transmission over the AFARN by land maneuver units.

(U) D. Schedule Profile: See individual projects

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Advanced Communications Systems	PROJECT 1013
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1013 Theater Deployable Communications (TDC)	1,450	2,539	2,131	2,694	2,723	2,991	3,047	Continuing	TBD

(U) A. Mission Description and Budget Item Justification
 As clearly demonstrated during Desert Shield/Desert Storm (DS/DS), today's generation of deployable communications equipment is bulky, inflexible in design and does not meet today's projected airlift availability or interoperability standards. Air Force planning calls for initial communications assets to be in place prior to the arrival of flying forces. Deployment priorities for DS/DS did not allow timely arrival of communications assets. This program will complete joint interoperability certification testing, begin development and implementation of integrated network management software, and to support field activities and conduct integration activities. This program also emphasizes COTS equipment to augment existing assets or replace tactical communications packages. The resulting Theater Deployable Communications (TDC) packages will reduce airlift requirements and be designed to support a wide range of operational scenarios during deployment/employment, expansion and sustaining operations. Communications packages will be used by theater air control, combat communications, special operations units, deployed air wings, and mobility forces worldwide.

(U) FY 1997 (\$ in Thousands):

- (U) \$356 Continue communications architecture planning.
- (U) \$457 Continue development of automation tools
- (U) \$637 Continue field interoperability and integration activities
- (U) \$1,450 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Advanced Communications Systems	PROJECT 1013
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(U) FY 1998 (\$ in Thousands):

- (U) \$436 Continue communications architecture planning
- (U) \$523 Continue development of automation tools
- (U) \$1,280 Continue field interoperability and integration activities
- (U) \$300 Start production improvement and interface development
- (U) \$2,539 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$299 Continue communications architecture planning
- (U) \$490 Continue development of automation tools
- (U) \$1,013 Continue field interoperability and integration activities
- (U) \$329 Continue production improvement and interface development
- (U) \$2,131 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Previous President's Budget (FY1998 PB)	1,450	2,766	2,674
(U) Appropriated Value	1,622	2,766	
(U) Adjustments to Appropriated Value			
a. Congressional Reductions	-133	-167	
b. Small Business Innovative Research	-39	-60	
c. Omnibus and Other Above Threshold			
Reprogramming			
(U) Adjustment to Budget Years Since FY 98 President			-543
Budget			
(U) Current Budget Submit/FY 1999 President's Budget	1,450	2,539	2,131

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Advanced Communications Systems	PROJECT 1013
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(U) Change Summary Explanation:

Funding: N/A

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837100, PE 0207423F	54,456	29,155	27,342	26,838	75, 999	79,190	128,876	Cont.	TBD
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 86190A, PE 0207423F,	2,270	4,556	2,450	2,258	2,039	100	99	Cont.	TBD
(U) Operations and Maintenance AF, PE 0207422F	1,438	2,155	3,124	4,168	5,238	5,336	5,438	Cont.	TDB

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207423F Advanced Communications Systems						PROJECT 1013		
(U) D. <u>Schedule Profile</u>													
		<u>FY 1997</u>					<u>FY 1998</u>					<u>FY 1999</u>	
	1	2	3	4	1	2	3	4	1	2	3	4	
1013 Theater Deployable Comm													
(U) Acquisition Milestones													
						X							
											X		
(U) Production SATCOM Contract Award (Awarded AUG 95)													
(U) Production SATCOM Deliveries Start *													
(U) Production Contract for Integrated Communication Access Packages (ICAP) Award (Awarded OCT 96) *													
(U) Production of Integrated Communications Access Packages (ICAP) Deliveries Start X													
(U) Complete SATCOM (OT) *													
(U) Complete ICAP (OT) X													
* denotes completed event													

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207423F Advanced Communications Systems			PROJECT 1013		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Software Support				457	902	786			
(U)	Engineering Support				356	400	294			
(U)	Integration Activities				580	1,167	981			
(U)	Travel				40	55	60			
(U)	Miscellaneous				17	15	10			
(U)	Total				1,450	2,539	2,131			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Various							1,069	636	Cont	Cont
<u>Support and Management Organizations</u>										
MITRE	FFP	OCT 96	TBD	TBD	1713	976	980	1000	Cont	Cont
TEMS	FFP	Varies				474	490	495	Cont	Cont
<u>Test and Evaluation Organizations</u>										
Air Force Test & Evaluation Command	TBD									
Project 1013					Page 8 of 14 Pages			Exhibit R-3 (PE 0207423F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207423F Advanced Communications Systems				PROJECT 1013	
Government Furnished Property: Not Applicable									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
N/A									
<u>Support and Management Property</u>									
N/A									
<u>Test and Evaluation Property</u>									
N/A									
Subtotal Product Development				0	0	0	0		
Subtotal Support and Management				1713	1450	2539	2131	Cont	Cont
Subtotal Test and Evaluation				0	0	0	0		
Total Project				1713	1450	2539	2131	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Advanced Communications Systems	PROJECT 2982
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2982 Anti-Jam Radio Communications	196	189	217	222	224	0	0	0	20,121

(U) A. Mission Description and Budget Item Justification

The fast paced development of new frequency hopping radio technologies by potentially hostile nations dictates that the U.S. maintains a technological lead. Ultra high frequency (UHF) frequency hopping voice radios are needed for jam resistant communications between tactical aircraft and airborne and ground control elements. The HAVE QUICK wave form used in these radios is the NATO standard for UHF anti-jam communications. The HAVE QUICK UHF radios provide the primary Air Force and DOD UHF Electronic Counter-Countermeasures (ECCM) voice communications. SINCGARS (Single Channel Ground and Airborne Radio System) provides anti jam, very high frequency (VHF) frequency hopping radios and data communications and is the primary means of ECCM communications between Air Force, Army, USMC aircraft and ground units involved in close air support and joint battlefield operations.

(U) FY 1997 (\$ in Thousands):

- (U) \$50 Completed software support for the HAVE QUICK II radios.
- (U) \$96 Continued to investigate improvements in anti-jam performance and other anti-jam techniques.
- (U) \$50 Completed support of SINCGARS Phase II qualification testing and support platform integration analyses.
- (U) \$196 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$89 Continue to investigate improvements in anti-jam performance and other anti-jam techniques.
- (U) \$100 Begin to investigate decrease in air traffic control channel bandwidth and modulation techniques.
- (U) \$189 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$96 Continue to investigate improvements in anti-jam performance and other anti-jam techniques.
- (U) \$121 Continue to investigate decrease in air traffic control channel bandwidth and modulation techniques.
- (U) \$217 Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Advanced Communications Systems	PROJECT 2982
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Previous President's Budget (FY 1998 PB)	196	200	221
(U) Appropriated Value	200	200	
(U) Adjustments to Appropriated Value			
a. Congressional Reductions	-4	-7	
b. Small Business Innovative Research		-4	
c. OMINIBUS and Other AboveThreshold Reprogramming			
(U) Adjustment to Budget Year Since FY 1998 President Budget.			-4
(U) Current Budget Submit/ FY 1999 President's Budget	196	189	217

(U) Change Summary Explanation:

Funding: N/A

Schedule: N/A

Technical: N/A

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207423F Advanced Communications Systems	PROJECT 2982
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>
(U) Other Procurement AF, Budget Activity 3, Weapon System Code 837100, PE 0207423F	8,015	3,530	3,722	3,886	10,552	10,727	10,809	0	TBA
(U) Aircraft Procurement AF Budget Activity 5, Weapon System Code OTHACF, PE 0207423F	512	0	0	0	0			0	23,230

(U) D. Schedule Profile

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) HQ II Software Support Efforts	1	2 3	4 1
(U) Platform Integration analyses	*	2 3	4 1
(U) Investigate anti-jam improvements	*	2 3	4
(U) Analyze decrease in ATC bandwidth			X

* denotes completed event

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207423F Advanced Communications Systems			PROJECT 2982		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) a.	Software Support				46	49	50			
(U) b.	Engineering Support				28	28	30			
(U) c.	Evaluation Analysis				77	73	78			
(U) d.	Test and Evaluation				20	25	25			
(U) e.	Travel				13	14	20			
(U) f.	R&D Centers Payments				0	0	0			
(U) g.	Miscellaneous				12	0	14			
(U)	Total				196	189	217			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
N/A										
<u>Support and Management Organizations</u>										
MITRE	FFP	OCT 96	TBD	TBD	108.5	125	119	131	Cont	Cont
TEMS	FFP	Varies				71	70	86		
<u>Test and Evaluation Organizations</u>										
AFOTEC	TBD									
Project 2982					Page 13 of 14 Pages			Exhibit R-3 (PE 0207423F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207423F Advanced Communications Systems				PROJECT 2982	
Government Furnished Property: Not Applicable									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
NA									
<u>Support and Management Property</u>									
N/A									
<u>Test and Evaluation Property</u>									
TBD									
Subtotal Product Development									
Subtotal Support and Management				109	196	189	217	446	20,021
Subtotal Test and Evaluation				0	0	0	0		
Total Project				109	196	189	217	446	20,021

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	32,712	24,778	27,292	24,174	19,854	13,228	13,834	0	TBD
3330 Cmd Cntrl Info Process Sys (C2IPS)	5,469	4,426	14,314	11,939	9,563	2,260	2,387	0	TBD
4287 Contingency Theater Automated Planning System (CTAPS)	23,916	14,343	9,040	8,485	6,545	10,968	11,447	Continuing	TBD
4288 Wing C2 System (WCCS)	3,327	6,009	3,938	3,750	3,746	0	0	0	31,778
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The Theater Battle Management Core Systems (TBMCS) develops force-level and wing-level command, control, and intelligence systems which utilize DoD's Global Command and Control System (GCCS) Defense Information Infrastructure (DII) common operating environment (COE). Acquisition of these systems will allow the execution of TBM planning, intelligence, and operational functions of the Joint Forces Air Component Commander (JFACC), including the air tasking order (ATO). Projects included in this program are Command & Control Information Processing System (C2IPS), Contingency Theater Automated Planning System (CTAPS), and Wing Command & Control System (WCCS). Another project, Combat Intelligence System (CIS) is migrating to the DII COE and will directly interface TBMCS, but RDT&E funds for CIS are programmed under PEs 0604321F, 0207431F, and 0305158F (FY97), and 0207414F (FY98+). The TBMCS effort is Post Milestone III effort, and is in Budget Activity 7, Operational Systems Development because it incrementally upgrades and develops capabilities for currently operational systems.

(U) Acquisition Strategy:

Electronic Systems Center (ESC), Hanscom AFB, MA will manage the overall TBMCS program (CTAPS, WCCS, CIS, and C2IPS). Lockheed-Martin Command and Control Systems (LMCCS) was competitively selected and is performing the TBMCS software integration and - when directed by the government - will develop individual applications consistent with the GCCS DII COE. C2IPS efforts will continue under the current prime contractor, Computer Sciences Corporation (CSC). C2IPS migration into the DII COE will begin in FY98.

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	32,766	24,013	35341	TBD
(U) Appropriated Value	34,415	27,013		
(U) Adjustments to Appropriated Value				
a. Congressional Reductions	-827	-1,670		
b. Small Business Innovative Research	-822	-565		
c. Rescissions	-54			
(U) Adjustments to Budget Years Since FY 1998 PB		0	-8049	
(U) Current Budget Submit / FY 1999 President's Budget	32,712	24,778	27,292	TBD

(U) Change Summary Explanation:

Funding: FY97: FY 97 changes as shown above.
 FY98: No change.
 FY99: Funds moved to FY 01 to support a more incremental development schedule for C2IPS.
 Schedule: See Individual Projects.
 Technical: See Individual Projects.

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) Other Procurement, AF (0207438F)	46,129	46,920	44,654	48,351	52,224	45,551	44,783	Cont	TBD
(U) Operations and Maintenance, AF (0207438F)	3,145	3,155	5,417	5,586	6,879	6,522	6,920	Cont	TBD
(U) Operations and Maintenance, AF (0207415F)	9,105	18,566	20,505	20,871	22,302	13,376	13,645	Cont	TBD
(U) O&M, PE 0207431, CAIS	4,864	1,968	2,778	3,752	4,797	4,913	5,039	Cont	TBD
(U) RDT&E, PE 0207431F, CAIS	7,373	0	0	0	0	0	0	0	7,373
(U) RDT&E, PE 0305158F, Projec 4394	1,945	0	0	0	0	0	0	Cont	1,945
(U) RDT&E, PE 0604321F, CIS-EMD	2,622	0	0	0	0	0	0	0	2,622
(U) Other Procurement, PE 0207414F	9,705	18,489	13,206	18,718	14,452	11,932	11,928	Cont	TBD
(U) Other Procurement, PE 0207431F	2,150	3,730	3,016	5,206	4,028	3,063	3,072	Cont	TBD
(U) Other Procurement, PE 0305158F	1,951	0	0	0	0	0	0	0	2,919

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) WCCS 1.2 Release		X										
(U) CTAPS Version 5.2 Release			X									
(U) TBMCS S/W Version 1.0												
(U) Preliminary Design Review	X											
(U) In-Plant Test						X						
(U) Version 1.0 Release								X				
(U) TBMCS S/W Version 2.0												
(U) Preliminary Design Review										X		
(U) In-Plant Test (FY00)												
(U) Version 2.0 Release (FY00)												

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I	PROJECT 3330
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3330 Cmd Cntrl Info Process Sys (C2IPS)	5,469	4,426	14,314	11,939	9,563	2,260	2,387	0	TBD

(U) A. Mission Description and Budget Item Justification

The Command & Control Information Processing System (C2IPS) project develops communications and information processing hardware and software for all echelons of the Air Mobility Command (AMC). C2IPS provides AMC the capability to monitor in real-time the operational airlift and tanker functions associated with mission execution worldwide. The integration of C2IPS computer resources and software with improved High Frequency (HF) equipment and other available communications media will result in a unified AMC C2 System.

(U) Acquisition Strategy:

The C2IPS will be developed and installed in four increments. Increment 1 provided a digital data message handling capability at each Information Processing System (IPS) node and implements mission execution monitoring. Increment 2 builds on Increment 1 software to support mission planning and scheduling. Increment 3 will provide C2IPS with a client server architecture as part of the system migration efforts. Increment 4 completes the directed C2IPS efforts for the incremental development, and lays the foundation for the migration strategy that will merge features of C2IPS into TBMCS.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 3,053 Completed Incremented 2.0D software development
- (U) \$ 325 Completed Increment 3.0 software development
- (U) \$ 500 Started 3.B, 3.C and Increment 4 software development.
- (U) \$ 1,336 Continued implementation of force- and unit-level migration strategies.
- (U) \$ 255 Completed Initial Operational Test & Evaluation (OT&E) force and unit level migration.
- (U) **\$5,469 Total**

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I	PROJECT 3330																																													
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$ 850 Continue increments 3A and 3B software development – (U) \$ 2,514 Continue increment 3C(Data partitioning, Advanced Network Options and Y2K revisions) – (U) \$ 1,062 Start increment 4 (Detailed Planning & Scheduling for integration of AMC Aircraft Schedules) – (U) \$ 4,426 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$ 7,900 Complete C/S software and evaluation (3A/3B/3C) – (U) \$ 5,414 Continue increment 4 (Detailed Planning & Scheduling for integration of AMC Aircraft Schedules) – (U) \$ 1,000 Start requirements planning & segmentation for integration into DII COE – (U) \$ 14,314 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">5,469</td> <td style="text-align: center;">4,764</td> <td style="text-align: center;">22,102</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">5,779</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional Reductions</td> <td style="text-align: center;">-172</td> <td style="text-align: center;">-237</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. Small Business Innovative Research</td> <td style="text-align: center;">-138</td> <td style="text-align: center;">-101</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-7,788</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit / FY 1999 President's Budget</td> <td style="text-align: center;">5,469</td> <td style="text-align: center;">4,426</td> <td style="text-align: center;">14,314</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: FY99 funds are transferred to FY01 to create a lower risk acquisition profile more appropriate to incremental development.</p> <p style="padding-left: 40px;">Schedule: Some functionality will be rephased between increments.</p> <p style="padding-left: 40px;">Technical: N/A</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	5,469	4,764	22,102	TBD	(U) Appropriated Value	5,779				(U) Adjustments to Appropriated Value					a. Congressional Reductions	-172	-237			b. Small Business Innovative Research	-138	-101			c. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB			-7,788		(U) Current Budget Submit / FY 1999 President's Budget	5,469	4,426	14,314	TBD
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																											
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I	PROJECT 3330
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(U) C. Other Program Funding Summary (\$ in Thousands) - Not Applicable.

(U) D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) <u>Increment 2.0D</u>												
(U) DT&E			X									
(U) Operational Test & Evaluation (OT&E)				X								
(U) <u>Increment 3</u>												
(U) TRR			X									
(U) DT&E					X							
(U) <u>Increment 4</u>												
(U) SSR					X							
(U) PDR						X						
(U) TRR							X					
(U) DT&E								X				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I				PROJECT 3330	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Major Product Development Contracts				3,614	2,244	12,198			
(U)	Support Contracts				1,394	1,754	1,582			
(U)	Program Management Support				461	428	534			
(U)	Total				5,469	4,426	14,314			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Product Development Organizations</u>										
CSC	C/FPIF/FP	Dec 88	TBD	TBD	4,106	3,614	2,244	12,198	Cont.	TBD
<u>Support and Management Organizations</u>										
MITRE	SS/T&M	Oct 94	n/a	n/a	1,471	1,148	1,508	1,336	Cont.	TBD
TEMS	Various	Various	n/a	n/a	230	246	246	246	Cont.	TBD
ESC	n/a	n/a	n/a	n/a	824	461	428	534	Cont.	TBD
<u>Test and Evaluation Organizations</u> - Not Applicable.										
Government Furnished Property: Not Applicable										
Subtotal Product Development					4,106	3,614	2,244	12,198	Cont.	TBD
Subtotal Support and Management					2,525	1,855	2,182	2,116	Cont.	TBD
Subtotal Test and Evaluation										
Total Project					6,631	5,469	4,426	14,314	Cont.	TBD

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I	PROJECT 4287
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4287 Contingency Theater Automated Planning System (CTAPS)	23,916	14,343	9,040	8,485	6,545	10,968	11,447	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

The Contingency Theater Automated Planning System (CTAPS) program directly supports the Joint Forces Air Component Commander (JFACC) in the planning and execution of the theater air campaign down to the unit level. The system is designed to an open system standard, promoting interoperability among USAF, Services, and Allied command and control systems. The air tasking order generation and dissemination capabilities of CTAPS are the standard for all DoD command and control systems. On-going efforts are migrating the current system to Global Command and Control System (GCCS) Defense Information Infrastructure (DII) common operating environment (COE), ensuring compatibility, interoperability, and commonality among services

(U) Acquisition Strategy:

The program utilizes an evolutionary acquisition strategy that accommodates changes in user requirements and improvements in commercial technology through a series of planned incremental software releases.

(U) FY 1997 (\$ in Thousands):

- (U) \$17,069 Complete version planning process, continue design/development of TBMCS version 1.0, and the full Ops/Intel interoperability.
- (U) \$ 3,610 Continue Air Battle Planning and Architecture modifications to support the new Air Tasking Order (ATO) format.
- (U) \$ 307 Initiate version planning and design for TBMCS Version 2.
- (U) \$ 2,930 Systems engineering and support.
- (U) **\$23,916 Total**

(U) FY 1998 (\$ in Thousands):

- (U) \$ 9,989 Complete TBMCS software version 1.0 development and initiate TBMCS software version 2.0 development.
- (U) \$ 2,545 Complete development of new ATO format.
- (U) \$ 809 Systems engineering and support.
- (U) \$ 1,000 Integrate Combat Integration Capability (CIC) into TBMCS.
- (U) **\$14,343 Total**

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I	PROJECT 4287
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(U) FY 1999 (\$ in Thousands):

- (U) \$ 5,357 Continue TBMCS software version 2.0 development.
- (U) \$ 1,765 Technical insertion activities.
- (U) \$ 918 Systems engineering and support.
- (U) \$ 1,000 Continue integration efforts of CIC into TBMCS.
- (U) **\$9,040 Total**

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	23,970	12,886	9,222	TBD
(U) Appropriated Value		15,886		
(U) Adjustments to Appropriated Value				
a. Congressional Reductions		-1216		
b. Small Business Innovative Research		-327		
c. Rescissions	-54			
(U) Adjustments to Budget Years Since FY 1998 PB			-182	
(U) Current Budget Submit / FY 1999 President's Budget	23,916	14,343	9,040	TBD

(U) Change Summary Explanation:

Funding: FY98: Includes \$3M plus-up . Adjustments as shown above.
 Schedule: Not Applicable.

Technical: FY 98/99: Add Combat Integration Capability (CIC) within TBMCS.

(U) **C. Other Program Funding Summary (\$ in Thousands)** - Please see Program Summary above.

(U) **D. Schedule Profile** - Please see Program Summary above.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I			PROJECT 4287		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	System Integration and Development				20,145	13,041	8,122			
(U)	System Engineering				1,291	450	346			
(U)	TEMS				1,823	852	572			
(U)	SPO Support				657	0	0			
(U)	Total				23,916	14,343	9,040			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
LMCCS	C/CPAF/PR	Oct 95	TBD	TBD	1,169	16,328	10,421	7,865	Cont.	TBD
SAIC (S/W INT) Hampton VA	C/CPFF/FCA	Mar 94	n/a	n/a	11,085	0	0	0	0	11,085
SAIC (ASOC/BSD) Hampton VA, Anchorage AK	C/CPFF/FCA	Feb 94	n/a	n/a	3,759	0	0	0	0	3,759
PARAMAX (APS) St Paul MN	C/CPFF/FCA	Mar 94	n/a	n/a	1,207	0	0	0	0	1,207
INEL (ASOC) Idaho Falls ID	C/CPFF/FCA	Oct 94	n/a	n/a	1,243	0	0	0	0	1,243
Project 4287					Page 10 of 17 Pages			Exhibit R-3 (PE 0207438F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I				PROJECT 4287	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Logicon, Inc San Pedro, CA	C/CPFF/FCA	Jun 94	n/a	n/a	0	3,610	2,545	0	0	6,155
Miscellaneous	Various	Various	n/a	n/a	410	0	0	0	0	410
<u>Support and Management Organizations</u>										
MITRE	SS/CPAF	Oct 94	n/a	n/a	5,237	2,614	450	346	Cont.	TBD
TEMS	C/T&M	Various	n/a	n/a	1,430	400	400	400	Cont.	TBD
Miscellaneous	Various	Various	n/a	n/a	2,137	841	452	354	0	2,978
<u>Test and Evaluation Organizations</u>										
46 TS	Project Order	Various	n/a	n/a	0	46	75	75	Cont	TBD
JTIC	MIPR	Various	n/a	n/a	0	77	0	0	0	77
Government Furnished Property: Not Applicable										
Subtotal Product Development					18,873	19,938	12,966	7,865	Cont.	TBD
Subtotal Support and Management					8,804	3,855	1,302	1,100	Cont.	TBD
Subtotal Test and Evaluation					0	123	75	75	Cont.	TBD
Total Project					27,677	23,916	14,343	9,040	Cont.	TBD

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I	PROJECT 4288
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4288 Wing C2 System (WCCS)	3,327	6,009	3,938	3,750	3,746	0	0	0	31,778

(U) A. Mission Description and Budget Item Justification

This project includes development of mission critical application software for WCCS operating on commercially available hardware and system software. Wing commanders require an accurate, composite picture of their wing's total resources to effectively command, control, and manage their forces in support of their combat sortie generation and reporting responsibilities. Key functional areas (operations, maintenance, mission planning, intelligence, weather, etc.) use WCCS to support the wing commander in the mission execution and reporting process by exchanging critical command and control and intelligence information with functional counterparts located throughout the wing. The introduction of increasingly sophisticated weapon systems - with their need for and ability to produce large amounts of data - require an automated C2 system to bring meaningful, consolidated information to the Commander in near real-time. Today, this information is relayed over secure and unsecured telephones, radios, and other communications devices, as well as by runners to update multi-user status displays (grease boards) or hand written logs. These techniques have not changed substantially since World War II, and are cumbersome, error-prone, are subject to security compromise, and involve duplication of effort. Disparate programs have led to the proliferation of stovepipe systems which can not provide interoperability and do not adequately meet the needs of today's air operations. The WCCS program will design, develop, and install an automated, standard wing-level C2 system that will be tailored to meet unique organizational requirements, provide interoperability, and reduce training and maintenance costs.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		PROJECT
7 - Operational System Development	0207438F Theater Battle Management (TBM) C4I	February 1998 4288
<p>(U) <u>Acquisition Strategy:</u></p> <p>Electronic Systems Center (ESC), Hanscom AFB, MA will manage the overall TBMCS program (CTAPS, WCCS, CIS, and C2IPS). Lockheed-Martin Command and Control Systems (LMCCS) was competitively selected and is performing the TBMCS software integration and - when directed by the government - will develop individual applications consistent with the GCCS DII COE.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 2,797 Continue design and development of TBMCS software version 1.0. <ul style="list-style-type: none"> - (U) Complete scheduler. - (U) Phase II Decision Support System (DDS) Module. - (U) Continue first phase of security enhancement implementation. - (U) Include/modify unit/force level interfaces (Air Force Mission Support System (AFMSS), Automated Weather Distribution System (AWDS), Base Recovery Control System (BRCS), and Combat Ammunition System-Base (CAS-B). - (U) P3I efforts. - (U) Continue force/unit level migration. - (U) \$ 105 Initiate TBMCS software version 2.0 version planning and design. - (U) \$ 425 Systems engineering and support. - (U) \$3,327 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 353 Initiate TBMCS software version 2.0 development. - (U) \$5,390 Complete TBMCS software version 1.0 development. - (U) \$ 266 Systems engineering and support. - (U) \$6,009 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$2,547 Continue TBMCS software version 2.0 development. - (U) \$1,150 Technical insertion activities. - (U) \$ 241 Systems engineering and support. - (U) \$3,938 Total 		
Project 4288	Page 13 of 17 Pages	Exhibit R-2 (PE 0207438F)

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3) DATE **February 1998**

BUDGET ACTIVITY **7 - Operational System Development** PE NUMBER AND TITLE **0207438F Theater Battle Management (TBM) C4I** PROJECT **4288**

(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) System Integration and Development	2,787	5,743	3,697
(U) Systems Engineering	176	66	61
(U) TEMS	249	200	180
(U) SPO Support	115	0	0
(U) Total	3,327	6,009	3,938

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I	PROJECT 4288
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
LMCCS	C/CPAF/PR	Oct 95	TBD	TBD	50	2,787	5,743	3,697	Cont.	TBD
SAIC	C/CPFF/FCA	Jan 94	n/a	n/a	5,000	0	0	0	0	5,000
<u>Support and Management Organizations</u>										
MITRE	SS/CPAF	Oct 94	n/a	n/a	750	176	66	61	Cont.	TBD
TEMS & Misc	Various	Various	n/a	n/a	904	364	200	180	Cont.	TBD
<u>Test and Evaluation Organizations</u> - Not Applicable										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207438F Theater Battle Management (TBM) C4I				PROJECT 4288	
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
Local Purchase	Various	Various	Various	128	0	0	0	Cont.	TBD
<u>Support and Management Property</u> - Not Applicable									
<u>Test and Evaluation Property</u> - Not Applicable									
Subtotal Product Development				5,178	2,787	5,743	3,697	Cont.	TBD
Subtotal Support and Management				1,654	540	266	241	Cont.	TBD
Subtotal Test and Evaluation				0	0	0	0	Cont.	TBD
Total Project				6,832	3,327	6,009	3,938	Cont.	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207581F Joint STARS			PROJECT 0003		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0003 JSTARS	0*	118,335	123,793	87,673	125,453	141,051	112,334	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* Note: Joint STARS RDT&E funds for FY97 and prior were in PE 0604770F.

(U) **A. Mission Description and Budget Item Justification**

There is an Air Force and Army need to provide, from airborne platforms, near-real time surveillance and targeting information on moving and stationary ground targets (growth to maritime operations), slow moving rotary and fixed wing aircraft, and rotating antennas. This information enables operational and tactical commanders to make and execute battle decisions. To meet these needs, the Air Force and Army initiated the Joint Surveillance Target Attack Radar System (Joint STARS) program with the Air Force as lead service. Joint STARS provides target information for pairing direct attack aircraft and standoff weapons against selected targets. The system is capable of being cued by other reconnaissance, surveillance, and target acquisition systems; is able to respond rapidly to worldwide contingencies; and provides surveillance and attack information in all light and near-all-weather conditions. The operational utility of the system was effectively demonstrated by the outstanding performance of two developmental aircraft in support of combat operations during Desert Storm. Joint STARS aircraft were deployed in support of Operation Joint Endeavor in Dec 95 and again from Nov to Dec 96. In Sep 96 the Defense Acquisition Board (DAB) Milestone III Review approved full rate production of a 19 E-8C program. The 93rd Air Control Wing, Robins AFB, GA, declared Joint STARS Initial Operational Capability (IOC) in Dec 97 and the system is now participating in operational and training exercises. After the Quadrennial Defense Review recommended a revision of the Joint STARS production profile the Air Force reduced Joint STARS production from 19 to 13 E-8Cs. The acquisition strategy is to procure 2 E-8Cs per year, starting in FY93, and ending in FY99, with 1 E-8C produced in FY98. This program is in Budget Activity 7 - Operational System Development.

(U) FY 1997 (\$ in Thousands): (Funds contained in PE 0604770F)

(U) FY 1998 (\$ in Thousands):

- (U) 4,960 Continue E-8C follow-on development and testing program
- (U) 8,664 Continue Support Systems and Crew Trainer Development
- (U) 24,350 Continue Self Defense Suite (SDS) and E-8C Follow-On Test Support (FOTS)
- (U) 17,776 Continue Government Furnished Equipment (GFE), program support, test, and other miscellaneous efforts
- (U) 59,585 Continue Life Cycle Cost Reduction Initiatives
- (U) 3,000 Initiate Radar Technology Insertion Program (RTIP)
- (U) 118,335 Total

Project 0003 Page 1 of 5 Pages Exhibit R-2 (PE 0207581F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207581F Joint STARS	PROJECT 0003																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 6,397 Continue E-8C follow-on development and test program (Joint STARS Integrated Maintenance Information System (JIMIS) and Site Activation Task Force (SATAF) Tech Order Verification) - (U) 6,271 Continue Support Systems and Crew Trainer Development - (U) 21,079 Continue SDS and E-8C FOTS - (U) 16,368 Continue GFE, program support, test, and other miscellaneous efforts - (U) 33,498 Continue Life Cycle Cost Reduction Initiatives and DAMA-compliant SATCOM upgrade - (U) 40,180 Continue RTIP development - (U) 123,793 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">119,189</td> <td style="text-align: center;">84,458</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td></td> <td style="text-align: center;">126,189</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. General Congressional Reductions</td> <td></td> <td style="text-align: center;">4,830</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. Small Business Innovative Research</td> <td></td> <td style="text-align: center;">3,024</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus, Other Above Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">39,335</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">0</td> <td style="text-align: center;">118,335</td> <td style="text-align: center;">123,793</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation</p> <p style="padding-left: 40px;">Funding: Joint STARS RDT&E funds for FY97 were in PE 0604770F. The appropriated value for FY98 includes an increase of \$3.0 million for Cruise Missile Defense upgrades and \$4.0 million for integration of the Improved Data Modem (IDM). The increase to the FY99 budgeted amount is for the Radar Technology Insertion program (RTIP). There is a pending reprogramming of \$805 thousand in FY98 RDT&E for higher priority requirements.</p> <p style="padding-left: 40px;">Schedule: The FY99 Budget request reduces the production quantity from 19 to 13 E-8Cs, with FY99 the final production year. No changes to RDT&E schedule.</p> <p style="padding-left: 40px;">Technical: The RTIP effort will result in significant enhancements to the Joint STARS radar performance.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	0	119,189	84,458	TBD	(U) Appropriated Value		126,189			(U) Adjustments to Appropriated Value					a. General Congressional Reductions		4,830			b. Small Business Innovative Research		3,024			c. Omnibus, Other Above Threshold Reprogramming					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Since FY 1998 PB			39,335		(U) Current Budget Submit/FY 1999 President's Budget	0	118,335	123,793	TBD
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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Project 0003	Page 2 of 5 Pages	Exhibit R-2 (PE 0207581F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207581F Joint STARS	PROJECT 0003
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) Aircraft Procurement (BP 10)	534,649	327,730	463,051	47,521	11,954	12,979	7,573	Cont.	TBD
(U) Modifications (BP 11)			44,179	30,073	16,091	17,197	24,202	Cont.	TBD
(U) Spares (BP 16)	0	72,209	68,192	87,885	81,557	38,889	35,305	Cont.	TBD

Note: Procurement began with 2 aircraft per year in FY93, FY94, FY95, and FY96.

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Required Assets Availability (RAA)		*										
(U) Production Aircraft Deliveries	*				*	X	X	X		X		
(U) Full Rate Production Contract Award			*									
(U) Organic Support Capability					*							
(U) IOC					*							
(U) Mature Reliability								X				
(U) Follow-On OT&E Start						X						

* Accomplished event

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207581F Joint STARS			PROJECT 0003		
NOTE: Joint STARS RDT&E funds for FY 1997 and prior were in PE 0604770F.										
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Product Development					0	87,199	89,179			
(U) Support and Management						4,863	2,703			
(U) Test and Evaluation						<u>26,273</u>	<u>31,911</u>			
(U) Total					0	118,335	123,793			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
GMSD*	SS/CPIF	Nov 90	111,738	111,738	0	0	70,873	38,985	1,880	111,738
Other Misc. Studies	Various	Various	15,644	15,644	0	0	494	247	14,903	15,644
Flt. Crew Sim. Dual and Assoc.	SS/CPAF/FFP	May 94	4,811	4,811	0	0	3,875	936	0	4,811
MSIP Block 30 Upgrade	TBD	Various	48,421	48,421	0	0	0	3,270	45,151	48,421
Radar/IDM Improvements	TBD	TBD	299,780	299,780	0	0	7,000	40,180	252,600	299,780
Interop. Certif. Cap. GMSD	SS/CPIF	Dec 96	10,124	10,124	0	0	4,789	5,335	0	10,124
* Grumman Melbourne Systems Division (now Northrop Grumman)										
Project 0003					Page 4 of 5 Pages			Exhibit R-3 (PE 0207581F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207581F Joint STARS					PROJECT 0003
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
MITRE		Ongoing	N/A	N/A	0	0	218	227	236	681
Other Support. & Management		Ongoing	N/A	N/A	0	0	4,645	2,476	9,247	16,368
<u>Test and Evaluation Organizations</u>										
3246 Test Wing	PO		N/A	N/A	0	0	1,170	2,890	8,510	12,570
Eglin AFB Range Support										
E-8C FOTS	SS/FFP/CPFF	Aug 96	139,121	139,121			17,941	21,079	100,101	139,121
GMSD										
JTF Support	Allotment						7,162	7,942	33,883	56,149
<u>Government Furnished Property</u>										
JTIDS		Ongoing					168	226	0	394
<u>Support and Management Property</u>										
<u>Test and Evaluation Property</u>										
Subtotal Product Development					0	0	87,199	89,179	314,534	490,912
Subtotal Support and Management					0	0	4,863	2,703	9,483	17,049
Subtotal Test and Evaluation					0	0	26,273	31,911	142,494	200,678
Total Project					0	0	118,335	123,793	466,511	708,639

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207590F Seek Eagle
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	13,550	16,909	17,590	22,285	20,019	18,318	17,542	Continuing	Continuing
2784 Armament Standardization/Control/Munitions Material Handling Equipment	1,125	1,040	0*	0	0	0	0	0	3,317
4037 SEEK EAGLE Certifications	12,425	15,869	17,590	22,285	20,019	18,318	17,542	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* Funding for Project 2784 for FY99 and beyond is transferred to PE 64602F, Armament/Ordnance Development

(U) A. Mission Description and Budget Item Justification

The Air Force has a variety of combat aircraft and numerous stores (munitions, missiles, fuel tanks, electronic countermeasures pods, etc.). Aircraft carry these stores in countless different loading combinations determined by operational scenarios, missions, and tactics. Loading configurations change as operational plans and tactics change, and as new aircraft and stores are developed and produced. Before operational use, the Air Force must certify these configurations for safe loading, carriage, and separation (jettison and normal release), and must verify ballistics accuracy under the user-certified carriage and employment parameters. The Air Force SEEK EAGLE program completes these certifications through any combination of ground and flight testing, wind tunnel testing, advanced testing software, and engineering analysis. Over 700 aircraft-store combinations exist to be certified, with new ones added on a regular basis. Depending upon the complexity, certification takes from months to years. The SEEK EAGLE program is also responsible for insertion of new and emerging technologies into the SEEK EAGLE process and providing resources for sustainment of a viable Air Force aircraft-store certification capability. Electronic Technical Orders (TO's) are developed through the Combat Weapons Delivery Software (CWDS), creating cost savings by eliminating paper technical orders. The Armament Standardization/Control/Munitions Material Handling Equipment (MMHE), Project 2784, satisfies several USAF and Tri-service requirements for standardization of armament and support equipment and eliminates unnecessary duplication of MMHE. Starting in FY99 and out, management responsibility for Project 2784 will transfer from Seek Eagle to the Armament/Ordnance Development program, PE 64602F. Seek Eagle funds are currently budgeted to support certification for new weapons programs including F-22, JSF, SFW, WCMD, JDAM, JASSM, JSOW, AIM-9X, AIM-120 C-5, and many other inventory stores on inventory aircraft. The RDT&E Budget Activity is 7. Operational Systems Development because the PE supports fielded systems.

(U) B. Acquisition Strategy

Please see "Acquisition Strategy" under each individual R-2 for details.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207590F Seek Eagle
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	15,075	17,716	19,146	51,937
(U) Appropriated Value	15,469	17,716		
(U) Adjustments to Appropriated Value				
a. Congressional General Reductions	-370	-736		
b. SBIR	-24	-71*		
c. Omnibus or Other Above Threshold Reprogram	-1,500			
d. Below Threshold Reprogramming		**		
e. Recissions	-25			
(U) Adjustments to Budget Years Since FY1998 PB			-1,556	
(U) Current Budget Submit/FY1999 President's Budget	13,550	16,909	17,590	48,049

(U) Change Summary Explanation:
 Funding: \$1.5M of FY97 funds were used for Omnibus reprogramming. FY99 funds of \$1.202M were transferred to Armament/Ordnance Development (funding for Project 2784 for FY99 and beyond is transferred to PE 64602F, Armament/Ordnance Development).
 * An additional \$1K is pending reprogramming for additional SBIR reductions in FY98.
 ** An additional \$20K in FY98 is pending reprogramming to fund higher Air Force priorities.
 Schedule: N/A
 Technical: N/A

(U) C. Other Program Funding Summary (\$ in Thousands)

Appropriation:

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Missile Procurement	7,986	1,112	10,418	8,002	8,296	10,200	8,395	Cont.	Cont.
(U) Procurement of Ammunition, AF		4,012			1,824			Cont.	Cont.

Note: The procurement dollars shown above are budgeted in each weapons' procurement line. Please refer to the next page for a FYDP weapon certification schedule/roadmap.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207590F Seek Eagle
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(U) D. Schedule Profile
 SEEK EAGLE program does not execute in accordance with established acquisition program milestones. Each aircraft-store configuration requested by the user goes through the SEEK EAGLE process by the designated user priority.

The following chart maps the planned procurement years of Seek Eagle certification units for next generation weapons programs:

	FY97	FY98	FY99	FY00	FY01	FY02	FY03
JSOW	X	X	X				
JDAM		X					
WCMD		X			X		
JASSM				X	X	X	
AIM-9X					X		X

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207590F Seek Eagle			PROJECT 2784					
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2784	Armament Standardization/Control/Munitions Material Handling Equipment			1,125	1,040	0*	0	0	0	0	0	3,317
Quantity of RDT&E Articles												
<p>* Funding for Project 2784 for FY99 and beyond is transferred to PE 64602F, Armament/Ordnance Development</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u> <u>Armament Standardization/Control/Munitions Material Handling Equipment (MMHE)</u>: This continuing project develops and improves the standardization and commonality of improved munitions handling and armament equipment to preclude duplication and proliferation. This project's efforts are limited to the study, design and development of MMHE and armament control systems.</p> <p>(U) B. <u>Acquisition Strategy</u> Funds are executed organically in support of munitions material handling equipment improvement studies, analyses, and tests.</p> <p>(U) <u>FY 1997 (\$ in Thousands)</u>:</p> <ul style="list-style-type: none"> - (U) \$ 970 Designed, prototyped, and tested various MMHE projects, i.e., complete testing of B-52H Yoke Fixture, JSOW Loading Pan, Rocket Module, UDL Discharge Chute, B-2/B-52 Rotary Launcher Loading Adapter, Fuze Torque Adapter, Ammo Drum Handling Bar, GCU-30 Adapter Tool, MHU-114 Stacking Fixture and Mechanical Ram Assembly; initiate design GBU Wing Container, MHU-83 Remote Control Upgrade, and AUR Container Handling Device; initiate evaluation of metal RAMS containers - (U) \$ 105 Continued design and manufacture of the Next Generation Munitions Handler Demonstrator and Aluminum Rail Set - (U) \$ 50 Continued prototype and testing of B-1B Rotary Launcher Adapter and Aluminum Rail Set - (U) \$ 1,125 Total <p>(U) <u>FY 1998 (\$ in Thousands)</u>:</p> <ul style="list-style-type: none"> - (U) \$ 610 Design, prototype, and test various MMHE projects, i.e., prototype and test GBU Wing Container and ISO Container Handling Device; initiate design of AME Maintenance Stand, T-2 Pallet Lock Device, and Flare Assembly Fixture; complete evaluation of RAMS Containers and testing of B-1B Rotary Launcher Adapter and MHU-83 Remote Control Upgrade - (U) \$ 230 Complete design/manufacture of Next Generation Munitions Handler Demonstrator, MHU-110 Trailer Upgrade, and Aluminum Rail Set - (U) \$ 100 Initiate design of Next Generation Munitions Trailer and B-52 ALCM Pylon Loading Adapter - (U) \$ 100 Initiate ISO Container Munitions Packaging and Bottom Lift Forklift Projects - (U) \$ 1,040 Total 												
Project 2784				Page 4 of 13 Pages				Exhibit R-2 (PE 0207590F)				

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207590F Seek Eagle	PROJECT 2784
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(U) FY 1999 (\$ in Thousands):

- (U) \$ 0 Total

(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	1,125	1,150	1,202	3,477
(U) Appropriated Value	1,181	1,150		
(U) Adjustments to Appropriated Value				
a. Congressional General Reductions	-32	-106		
b. SBIR	-24	-4		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming		**		
e. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-1,202*	
(U) Current Budget Submit/FY1999 President's Budget	1,125	1,040	0*	2,165

(U) B. Program Change Summary (\$ in Thousands) (Continued)

(U) Change Summary Explanation:

Funding: Funding for Project 2784 for FY99 and out is transferred to PE 64602F, Armament/Ordnance Development.

** An additional \$1K in FY98 is pending reprogramming to fund higher Air Force priorities.

Schedule: N/A

Technical: N/A

(U) **C. Other Program Funding Summary (\$ in Thousands):** Not Applicable

(U) **D. Schedule Profile:** Not Applicable

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207590F Seek Eagle	PROJECT 2784
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Various MMHE Projects	970	610	0
(U) Next Generation Munitions Handler	75	160	0
(U) MHU-110 Trailer Upgrade	0	50	0
(U) B-1B Rotary Launcher Adapter	50	0	0
(U) Aluminum Rail Set	30	20	0
(U) Next Generation Munitions Trailer	0	75	0
(U) ISO Container Handling	0	100	0
(U) ALCM Pylon Adapter	0	25	0
 (U) Total	 1,125	 1,040	 0*

* Funding for Project 2784 for FY99 and out is transferred to PE 64602F, Armament/Ordnance Development

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207590F Seek Eagle				PROJECT 2784	
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program*
<u>Product Development Organizations</u>										
Dept of Energy/NASA	T&M	Oct 96	N/A	N/A	500	75	160	0	0	735
<u>Support and Management Organizations</u>										
TEAS/TAMS	CP	Oct 97	N/A	N/A	377	506	535	0	0	1,418
AFDTC/FM	CP	Oct 97	N/A	N/A	130	160	120	0	0	410
646 SUPS/LGS	CP	Cont.	N/A	N/A	13	189	50	0	0	252
WL/MN	CP	Cont.	N/A	N/A	112	0	40	0	0	152
<u>Test and Evaluation Organizations</u>										
46th Test Wing			N/A	N/A	20	195	135	0	0	350
Government Furnished Property: Not Applicable										
Subtotal Product Development					500	75	160	0	0	735
Subtotal Support and Management					632	855	745	0	0	2,232
Subtotal Test and Evaluation					20	195	135	0	0	350
Total Project					1,152	1,125	1,040	0*	0	3,317
* Funding for Project 2784 for FY99 and out is transferred to PE 64602F, Armament/Ordnance Development										
Project 2784					Page 7 of 13 Pages			Exhibit R-3 (PE 0207590F)		

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207590F Seek Eagle	PROJECT 4037
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4037 SEEK EAGLE Certifications	12,425	15,869	17,590	22,285	20,019	18,318	17,542	Continuing	Continuing
Quantity of RDT&E Articles									

(U) A. Mission Description and Budget Item Justification

Air Force aircraft carry a variety of combat stores (munitions, missiles, fuel tanks, electronic countermeasures, pods, etc.) in countless different loading combinations determined by operational scenarios, missions, and tactics. Loading configurations change based on operational plans and tactics, and as new aircraft and stores are developed. Before operational use, the Air Force must certify these configurations for safe loading, carriage, and separation (jettison and normal release), and must verify ballistics accuracy under the user-specified carriage and employment parameters. The SEEK EAGLE program completes these certifications through any combination of ground and flight testing, wind tunnel testing, and engineering analysis. More than 700 aircraft-store configurations exist to be certified, with new ones added on a regular basis. Certification may take months to years to complete because of the diversity and interaction among systems being tested. The SEEK EAGLE program is also responsible for insertion of new and emerging technologies into the SEEK EAGLE process and providing resources to sustain a viable Air Force aircraft/store certification capability. Seek Eagle funds are currently budgeted to support certification for the following next generation weapons programs: SFW, WCMD, JDAM, JASSM, JSOW, AIM-9X, and AIM-120 C-5. Electronic Technical Orders (TO's) are developed through the Combat Weapons Delivery Software (CWDS).

(U) B. Acquisition Strategy

Procurement funds are planned and budgeted for by the Seek Eagle office, however, budget authorization is given directly to the weapon system program office. These program offices then plan the acquisition and contracting strategy.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 230 Initiated/developed F-22 data and engineering models to use for follow-on weapons certifications
- (U) \$ 1,682 Continued/completed aircraft load/separation prediction capability using Applied Computational Fluid Dynamics (ACFD)
- (U) \$ 8,713 Initiated/continued/completed aircraft-store certifications on fighter and bomber aircraft
- (U) \$ 1,800 Initiated/continued/developed/completed various automated Technical Orders/mission planning tools using CWDS
- (U) \$ 12,425 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0207590F Seek Eagle	February 1998 4037
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$ 1,750 Initiate/continue/develop F-22 data and engineering models to use for follow-on weapons certification- (U) \$ 2,100 Continue/complete aircraft load/separation prediction capability using Applied Computational Fluid Dynamics (ACFD)- (U) \$ 2,170 Initiate/continue/develop/complete various automated Technical Orders/mission planning tools using CWDS- (U) \$ 9,849 Initiate/continue/complete aircraft-store certification on fighter and bomber aircraft- (U) \$ 15,869 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$ 3,268 Initiate/continue/develop F-22 data and engineering models to use for follow-on weapons certification- (U) \$ 2,300 Initiate/continue/develop/complete various automated Technical Orders/mission planning tools using CWDS- (U) \$ 2,400 Continue/complete aircraft load/separation prediction capability using Applied Computational Fluid Dynamics (ACFD)- (U) \$ 9,622 Initiate/continue/complete aircraft-store certification on fighter and bomber aircraft- (U) \$ 17,590 Total		
Project 4037	Page 9 of 13 Pages	Exhibit R-2 (PE 0207590F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207590F Seek Eagle	PROJECT 4037
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	13,950	16,566	17,944	48,460
(U) Appropriated Value	14,288	16,566		
(U) Adjustments to Appropriated Value				
a. Congressional General Reductions	-338	-630		
b. SBIR		-67*		
c. Omnibus or Other Above Threshold Reprogram	-1500			
d. Below Threshold Reprogramming		**		
e. Rescissions	-25			
(U) Adjustments to Budget Years Since FY 1998 PB			-354	
(U) Current Budget Submit/FY1999 President's Budget	12,425	15,869	17,590	45,884

(U) Change Summary Explanation:

Funding: FY97 reductions were for Congressional General Reductions, SBIR, and support for contingency operations. FY98 reductions were for Congressional General Reductions and SBIR.

* An additional \$1 K is pending reprogramming for additional SBIR reductions in FY98.

** An additional \$19K in FY98 is pending reprogramming to fund higher Air Force priorities.

Schedule: N/A
Technical: N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207590F Seek Eagle	PROJECT 4037
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(U) C. Other Program Funding Summary (\$ in Thousands)

Appropriation:

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Missile Procurement	7,986	1,112	10,418	8,002	8,296	10,200	8,395	Cont.	Cont.
Procurement of Ammunition		4,012			1,824				Cont.

Note: The procurement dollars shown above are budgeted in each weapons' procurement line.

(U) D. Schedule Profile

The SEEK EAGLE program does not execute in accordance with established acquisition program milestones. Each aircraft-store configuration requested by the user goes through SEEK EAGLE process by the designated user priority.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207590F Seek Eagle	PROJECT 4037
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Product Development Organizations N/A

Support and Management Organizations

Mission Support	PO/REO	Continuous	N/A	N/A	7,167	1,150	1,050	1,100	Continuing	Cont.
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Test and Evaluation Organizations

46th Test Wing	PO/REO	Continuous	N/A	N/A	66,083	7,829	9,719	10,490	Continuing	Cont.
AEDC	PO/REO	Continuous	N/A	N/A	10,633	1,450	1,300	1,200	Continuing	Cont.
Various	PO/REO	Continuous	N/A	N/A	31,395	1,996	3,800	4,800	Continuing	Cont.

Government Furnished Property: Not Applicable

Subtotal Product Development					N/A					
Subtotal Support and Management					7,167	1,150	1,050	1,100	Continuing	Cont.
Subtotal Test and Evaluation					108,111	11,275	14,819	16,490	Continuing	Cont.
Total Project					115,278	12,425	15,869	17,590	Continuing	Cont.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	25,505	19,807	14,899	17,621	16,099	15,365	11,583	TBD	Continuing
1008 National Air and Space Warfare Model (NASM)	16,657	14,667	13,123	13,853	12,245	11,507	7,626	TBD	Continuing
1011 Joint Modeling & Simulation Integration Program (JMSIP)*	1,995	0	0	0	0	0	0	TBD	Continuing
2888 Theater Air Command & Control Sim Facility (TACCSF)*	0	5,140	0	0	0	0	0	TBD	Continuing
4566 Executive Agent for Air/Space Natural Environment*	0	0	0	0	0	0	0	TBD	Continuing
4567 Joint Modeling and Simulation System (JMASS)	0	0	1,776	3,768	3,854	3,858	3,957	TBD	Continuing
4582 ASC Simulation and Analysis Facility (SIMAF)	6,853	0	0	0	0	0	0	6,853	6,853
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

*Projects 1011 and 4566 were transferred to PE030861F beginning in FY 1999. Project 2888 was transferred to PE0207605F beginning in FY 1999. Reported in Justification Sheet for consistency.

(U) A. Mission Description and Budget Item Justification

Initiated in FY 94, this program is in budget activity 7 - Operational System Development, Research Category because it provides RDT&E funding for major USAF Modeling and Simulation efforts such as the National Air and Space Model (NASM)—the air and space element fo the Joint Simulation System (JSIMS); the Joint Modeling and Simulation System (JMASS); and manpower authorizations for JSIMS. JSIMS will be the sole readiness training simulation used by all CINCs, Services, NAFs and at all simulation centers to train Joint Force Commanders, Joint Task Force staffs, Components and their staffs, including Joint Force Air Component Commanders and Air Operations Center personnel. JMASS provides HLA-compliant architecture for engagement level simulations.

(U) Acquisition Strategy

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation						
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>				
						<u>Cost</u>				
(U)	FY1998 President's Budget	25,107	21,718	24,919		Continuing				
(U)	Appropriated Value	26,361	21,718							
(U)	Adjustments to Appropriated Value									
	a. Cong Reductions	-631	-1,410							
	b. SBIR	-623	-501							
	c. Omnibus or Other Above Threshold Reprogram									
	d. Below Threshold Reprogramming	+440								
	e. Recissions	-42								
(U)	Adjustments to Budget Years Since FY 1998 PB		+46	-10,020						
(U)	Current Budget Submit/1999 President's Budget	25,505	19,807	14,899		Continuing				
 (U) Change Summary Explanation:										
	Funding: FY97 - Below threshold reprogramming to supported increasing program activities.									
	FY98 - \$46K is pending reprogramming to fund higher priorities.									
	FY99 - Realignment to higher program priority									
	Schedule: See individual R-2s attached									
	Technical: See individual R-2s attached									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U)	O&M (AF 3400), PE27601F	42,824	29,119	360	534	536	630	607	Contin	Contin
(U)	Other Procurement (AF 834010 ADPE)	663	548							
 (U) D. <u>Schedule Profile</u> See individual R-2s										

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 1008
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1008 National Air and Space Warfare Model (NASM)	16,657	14,667	13,123	13,853	12,245	11,507	7,626	TBD	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program provides funds for Air Force and Joint wargaming architecture and model development, primarily in support of battlestaff training, education, and military operations. A new wargaming model, NASM, is being developed to replace the existing Air Force standard Air Warfare Simulation (AWSIM). NASM will expand the use and role of modeling and simulation (M&S) in support of operational and acquisition decision making, and increase the interoperability between Air Force and joint efforts. NASM includes an overall USAF M&S architecture and provides a reusable, portable, scaleable, robust distributed core for other simulations. It includes an air combat resolution model to meet the needs of USAF MAJCOMs and Unified/Specified Command air components to train Air Component Commanders and their battle staffs. Primary users will be the unified command air components, Command in Chief's (CINCs), Joint Forces Air Component Commander's (JFACC), and Service components, as supported by BLUE FLAG and WPC for use in joint exercises involving air, ground, and sea campaigns. NASM is the air component portion of the evolving DoD, Joint Staff and Services Joint Simulation System (JSIMS) initiative.

(U) Acquisition Strategy

(U) FY 1997 (\$ in Thousands):

- (U) \$ 7,549 Continue development of specific air objects to support JSIMS architecture
- (U) \$ 3,761 Continue NASM integration effort and operate the program management office
- (U) \$ 5,197 Implement, test, field and support configuration control board (CCB) approved Re-Engineered AWSIM
- (U) \$ 150 Expansion of functionality within Air Force Suite of Models (AFSOM)
- (U) \$ 16,657 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$ 9,400 Continue development of specific air objects to support JSIMS architecture
- (U) \$ 3,767 Continue NASM integration effort and operate the program management office
- (U) \$ 1,500 Implement, test, field and support configuration control board (CCB) approved Re-Engineered AWSIM
- (U) \$ 14,667 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998																																																		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 1008																																																			
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 9,194 Continue development of specific air objects to support JSIMS architecture - (U) \$ 2,801 Continue NASM integration effort and operate the program management office - (U) \$ 1,128 Support and configuration manage the Re-engineered AWSIM - (U) \$ 13,123 Total 																																																					
<p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) 1998 President's Budget</td> <td style="text-align: right;">16,259</td> <td style="text-align: right;">16,270</td> <td style="text-align: right;">18,360</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">17,323</td> <td style="text-align: right;">16,270</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td style="text-align: right;">-441</td> <td style="text-align: right;">-1,232</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-623</td> <td style="text-align: right;">-371</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: right;">+398</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-5,237</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 99 President's Budget</td> <td style="text-align: right;">16,657</td> <td style="text-align: right;">14,667</td> <td style="text-align: right;">13,123</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: FY97 - Adjustment supports increasing program activities. FY98 - \$34K is pending reprogramming to fund higher priorities. FY99 - Adjustments to fund higher priorities.</p> <p style="padding-left: 20px;">Schedule: No changes</p> <p style="padding-left: 20px;">Technical: None</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> None</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) 1998 President's Budget	16,259	16,270	18,360	Continuing	(U) Appropriated Value	17,323	16,270			(U) Adjustments to Appropriated Value					a. Cong Reductions	-441	-1,232			b. SBIR	-623	-371			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	+398				(U) Adjustments to Budget Years Since FY 1998 PB			-5,237		(U) Current Budget Submit/FY 99 President's Budget	16,657	14,667	13,123	Continuing
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																	
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(U) Adjustments to Budget Years Since FY 1998 PB			-5,237																																																		
(U) Current Budget Submit/FY 99 President's Budget	16,657	14,667	13,123	Continuing																																																	
Project 1008	Page 4 of 17 Pages	Exhibit R-2 (PE 0207601F)																																																			

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 1008
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) AWSIM Re-engineering												X
(U) NASM Prototypes												X
(U) NASM Integration												X
(U) Initial Op Capability (IOC) 4QFY99												
(U) Full Op Capability (FOC) 4QFY03												

Note: NASM development schedule coincides with the Joint Simulation System (JSIMS) schedule of Initial Operational Capability (IOC) in FY99 and Full Operational Capability (FOC) in FY03.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation				PROJECT 1008	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
National Air & Space Warfare Model (NASM)					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Cost Categories:										
(U) a. Software development					12,265	10,619	8,846			
(U) b. Contractor support					3,477	3,729	3,946			
(U) c. Program Management support					710	163	171			
(U) d. Travel					205	156	160			
(U) Total					16,657	14,667	13,123			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Raytheon (NASM)	TRN	3 Mar 97	52,793	52,793	0	7,638	9,400	7,584	28,171	52,793
Raytheon (AWSIM/R)	TRN	7 Apr 94	9,565	9,565	5,616	2,625	602	618	104	9,565
Hughes (AWSIM/R)	TRN	2 Jun 94	5,351	5,351	2,570	1,449	617	642	73	5,351
<u>Support and Management Organizations</u>										
Tech Eng Mgt Spt (TEMS)	Del Order	1 Feb 94	20,843	20,843	4,394	2,083	2,129	2,183	10,057	20,843
Project 1008					Page 6 of 17 Pages			Exhibit R-3 (PE 0207601F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation				PROJECT 1008	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
MITRE	Contract Mod	11 Aug 94	15,185	15,185	2,144	1,395	1,600	1,781	8,265	15,185
Other	Various	Various	20,070	20,070	16,786	1,467	319	315	1,183	20,070
<u>Test and Evaluation Organizations</u>										
None										
Total Project			123,835	123,835	31,510	16,657	14,667	13,123	46,734	123,835
Government Furnished Property:										
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date		Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Property</u>										
None										
<u>Support and Management Property</u>										
None										
<u>Test and Evaluation Property</u>										
None										
Subtotal Product Development					8,186	11,712	10,619	8,844	28,348	
Subtotal Support and Management					23,324	4,900	4,048	4,276	19,505	
Subtotal Test and Evaluation										
Total Project					31,510	16,657	14,667	13,123	46,743	
Project 1008										

DATE **February 1998**

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0207601F USAF Modeling and Simulation

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation				PROJECT 4567	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4567 Joint Modeling and Simulation System (JMASS)	0	0	1,776	3,768	3,854	3,858	3,957	TBD	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification**

The Joint Modeling & Simulation System (JMASS) is a simulation support environment for the development, configuration, execution, and analysis of high fidelity, repeatable simulations with re-usable models—focus is tactical/engagement level simulations with the present concentration on electronic combat. JMASS is a full system software implementation of a modern object based simulation architecture. JMASS provides users with the tools to: Develop objects, assemble these objects into models, configure the models in a complete simulation, execute the simulation, and post process the simulation data. JMASS tools assist users in developing fully compliant objects; users concentrate on the models and analysis, not computer science.

(U) **Acquisiton Strategy**

(U) FY 1997 (\$ in Thousands):

- (U) \$0 Not Applicable

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Not Applicable

(U) FY 1999 (\$ in Thousands):

- (U) \$ 491 High Level Architecture (HLA) Compliance
- (U) \$ 245 Improved User Interface
- (U) \$ 735 Develop Request For Proposal (RFP) documentation and operate the program management office
- (U) \$ 305 Prototype of JMASS software on a Personal Computer (PC)
- (U) \$ 1,776 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 4567
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) FY 1998 President's Budget	0	0	0	Continuing
(U) Appropriated Value				
(U) Adjustments to Appropriated Value				
a. Cong Reductions				
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1998 PB			+1,776	
(U) Current Budget Submit/FY 1999 President's Budget	0	0	1,776	Continuing

(U) Change Summary Explanation:
 Funding: FY 99 adjustment of \$1,776K to support JMASS architecture.

 Schedule: Not Applicable

 Technical: Not Applicable

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) PE64256F, Threat Simulator Development	6,685	4,090	4,100	2,100	2,100	2,100	2,100	Continue	25,899
Project 3321 (EW Test Resources)									
(U) PE 27601F, O&M (AF 3400)			490	582	579	686	664	Continue	3,002

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 4567
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(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) JMASS Releases		X			X							X
(U) Threat and Digital System Model (DSM) Releases												
(U) SA-2												X
(U) SA-3												X
(U) SA-5												X
(U) SA-6												X
(U) SA-8												X
(U) SA-10												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation				PROJECT 4567	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
Joint Modeling and Simulation System (JMASS)					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Cost Categories										
(U) a. Software Development							1,026			
(U) b. Contractor Support							250			
(U) c. Program Management Support							400			
(U) d. Travel							100			
(U) Total					0	0	1,776			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Various	Various				0	0	0	1,776	continuing	continuing
<u>Support and Management Organizations</u>										
None										
<u>Test and Evaluation Organizations</u>										
None										
Project 4567					Page 11 of 17 Pages			Exhibit R-3 (PE 0207601F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 4567
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property:

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
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Product Development Property

None

Support and Management Property

None

Test and Evaluation Property

None

Subtotal Product Development				0	0	0	1,776	continuing
Subtotal Support and Management								
Subtotal Test and Evaluation								
Total Project				0	0	0	1,776	continuing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 4582
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4582 ASC Simulation and Analysis Facility (SIMAF)	6,853	0	0	0	0	0	0	6,853	6,853
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Aeronautical Systems Center 's (ASC) Simulation and Analysis Facility (SIMAF), is an initiative that supports the CSAF's realization of a Joint Synthetic Battlespace in the AF's "New Vector for Modeling, Simulation & Analysis (MS&A)". The SIMAF is an addition at Wright-Patterson AFB, OH to integrate existing and emerging MS&A capabilities. SIMAF will interconnect ASC's MS&A capabilities and demonstration capabilities for AFMC product and technologies; link AFMC product Centers, AF Battle Labs, T&E infrastructure, and Industry; and jump start the AF involvement in the USD (A&T) simulation based acquisition (SBA) initiative.

(U) Acquisition Strategy

(U) FY 1997 (\$ in Thousands):

- (U) \$ 5,053 Development of hardware and software for constructive, virtual environment
- (U) \$ 1,100 Renovation of "common ground" facility with the physical gateway to the synthetic battlespace environment
- (U) \$ 700 Support program management activities
- (U) \$ 6,853 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Not Applicable

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Not Applicable

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 4582
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) FY1998 President's Budget	6,853			
(U) Appropriated Value	7,000			
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-147			
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) Current Budget Submit/FY 1999 President's Budget	6,853	0	0	6,853

(U) Change Summary Explanation:
Funding: FY 97 funding provided through Congressional add.

Schedule: Not Applicable

Technical: Not Applicable

(U) C. Other Program Funding Summary (\$ in Thousands) None

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U)									

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 4582
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Virtual Facility Development	X	X	X	X	X							
(U) Physical Facility Development		X	X	X	X	X	X	X				
(U) Hardware/Software Development	X	X	X	X	X							

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation			PROJECT 4582		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
ASC Simulation and Analysis Facility (SIMAF)					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Cost Categories										
(U) a. Hardware/Software Development					3,800					
(U) b. Contractor Support					2,153					
(U) c. Program Management Support					700					
(U) c. Travel					200					
(U) Total					6,853	0	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
ASC			6,853	6,853	0	6,853	0	0	6,853	6,853
<u>Support and Management Organizations</u>										
None										
<u>Test and Evaluation Organizations</u>										
None										
Project 4582					Page 16 of 17 Pages			Exhibit R-3 (PE 0207601F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207601F USAF Modeling and Simulation	PROJECT 4582
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property:

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
None									
<u>Support and Management Property</u>									
None									
<u>Test and Evaluation Property</u>									
None									
Subtotal Product Development				0	6,853	0	0	6,853	
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project				0	6,853	0	0	6,853	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207605F Wargaming and Simulation Centers	PROJECT 2888
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2888 Theater Air Command & Control Sim Facility (TACCSF)	0	5,140*	5,287	5,287	5,613	6,180	6,477	TBD	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

*FY98 dollars are executed through PE0207601F, USAF Modeling and Simulation, but reported here for consistency.

(U) A. Mission Description and Budget Item Justification

This PE will provide funding for the Air Force's premier warfighter-in-the-loop simulation facility operated at Kirtland AFB, NM by Det 4, 505th Command and Control Evaluation Group (505 CCEG). On 1 Oct 97, the 505 CCEG and TACCSF will fall under the authority of the Air and Space Command and Control Agency (ASC2A). TACCSF's mission is to provide advanced distributed simulation to the warfighter for improving theater air and space warfare systems and concepts of operation. TACCSF is used by the ASC2A and other customers who require high-fidelity battle management, command, control, communications, computer, and intelligence (BMC4I) simulation for establishing system requirements, assessing interoperability, integrating actual C4I and weapon system, and conducting joint test and evaluation. TACCSF performs the operations and maintenance (O&M) and upgrade of a complex equipment system consisting of 23 Air Force and Army weapon system simulators (containing over 2 million lines of software code), 18 internal computer networks, 36 mainframe computers, and 62 tactical warfighter-in-the-loop simulator consoles. These systems interoperate with joint service simulators and live fielded equipment via wide-area networks using state-of-the-art voice and data link communications over multiple long-haul communication circuits. FY98 funding is excuted through PE0207601F, USAF Modeling and Simulation.

(U) Acquisition Strategy

(U) FY 1997 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$ 3,322 Continue to maintain core structure to support users conducting RDT&E, mission rehearsal, and concepts of operations development
- (U) \$ 947 Continue to support requirements definition, tes support, scenario development, analysis, system engineering support, and Verification, Validation, & Accreditation (VV&A) of core system
- (U) \$ 531 Continue to upgrade the TACCSF infrastructure by conneting Distributed Interactive Simulation (DIS) and High Level Architecture (HLA)
- (U) \$ 240 In support of program office including travel.
- (U) \$ 100 Defense Simulation Internet (DSI) provides flexibility, dial-up connectivity between TACCSF and various other M&S facilities.
- (U) \$ 5,140 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207605F Wargaming and Simulation Centers	PROJECT 2888
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(U) FY 1999 (\$ in Thousands):

- (U) \$ 3,180 Continue to maintain core structure to support users conducting RDT&E, mission rehearsal, and concepts of operation development
- (U) \$ 1,055 Continue to support requirements definition, test support, scenario development, analysis, system engineering support, and VV&A of core system
- (U) \$ 708 Rehost AWACS and other systems from its ten year old equipment. The models should be rehosted to take advantage of object-oriented techniques allowing the sensor models to be imported into other simulations to save money and time. This design will also support tactical data link interfaces with operational systems
- (U) \$ 244 In support of approximately 175 TDY's, office supplies, and host base support
- (U) \$ 100 DIS provides flexibility, dial-up connectivity between TACCSF and various other M&S facilities.
- (U) \$ 5,287 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) FY1998 President's Budget	0	5,448	0	Contiuing
(U) Appropriated Value		5,448		
(U) Adjustments to Appropriated Value				
a. Cong Reductions		-178		
b. SBIR		-130		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1998 PB			+5,287	
(U) Current Budget Submit/FY 1999 President's Budget	0	5,140	5,287	Continuing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207605F Wargaming and Simulation Centers	PROJECT 2888
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(U) Change Summary Explanation:

Funding: FY98 - \$130K for additional SBIR reduction.

FY99 - Program being executed in PE0270605F, Wargaming and Simulation Centers

Schedule: Not Applicable

Technical: Not Applicable

(U) **C. Other Program Funding Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) PE27603F, O&M (AF 3400)			14,952	14,635	15,993	16,350	15,903	Continue	Continue
(U) Other Procurement (AF 3080)			523	527	556	557	561	Continue	Continue

(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2	3	4	
(U) Maintain Core Structure					X				X	X			X
(U) Continue Technical Support					X				X	X			X
(U) Support DIS & HLA					X				X				
(U) Unit Ops Exp					X				X	X			X
(U) DSI Service Fee					X				X	X			X
(U) Rehost AWACS & MCE									X				X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0207605F Wargaming and Simulation Centers			PROJECT 2888		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Cost Categories										
(U) a. Software Development										
						3,769	3,842			
(U) b. Contractor Support										
						1,026	1,090			
(U) c. Program Management Support										
						245	250			
(U) d. Travel										
						100	105			
(U) Total										
					0	5,140	5,287			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Det 4, 505 th CCEG		1 Jan 90	continuing	continuin g	0	0	5,140	5,287	continuing	continuing
<u>Support and Management Organizations</u>										
None										
<u>Test and Evaluation Organizations</u>										
None										
Project 2888					Page 4 of 5 Pages			Exhibit R-3 (PE 0207605F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0207605F Wargaming and Simulation Centers	PROJECT 2888
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: N/A

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
None									
<u>Support and Management Property</u>									
None									
<u>Test and Evaluation Property</u>									
None									
Subtotal Product Development				0	0	5,140	5,287	continuing	continuing
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project				0	0	5,140	5,287	continuing	continuing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208006F Mission Planning Systems	PROJECT 3858
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3858 Air Force Mission Support System (AFMSS)	17,606	14,747	17,090	17,069	17,262	17,471	17,764	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification**

(U) The Mission Planning System program was established in 1990 to consolidate mission planning system development efforts into a single unit-level mission planning system. This program maintains and preserves combat capability on old existing "legacy" planning systems which will migrate into a USAF wide standard mission planning system known as the Air Force Mission Support System (AFMSS). AFMSS acquisition strategy leverages military and commercial software integrated on Commercial-Off-The-Shelf (COTS) hardware. AFMSS encompasses evolutionary software and hardware development in an open systems architecture. AFMSS is the single unit-level mission planning system supporting all current/future aircraft and associated weapons: A/OA-10, F-15, F-16, F-22, EF-111, F-117, JSTARS, AWACS, ABCCC, U-2, AGM-130/GBU-15, JSSAM, JDAM, JSOW, B-1, B-2, B-52, KC-10, KC/EC/RC-135, C-5, C-9, C-17, C-21, C-141, MH/AH-6, MH-47, MH-53, MH-60, C/AC/EC/MC-130 and Tier II+/Tier III- Unmanned Aerial Vehicles (UAVs). AFMSS is currently being used operationally by six types of USAF aircraft and will be fielded to other types of aircraft as their software becomes available. It is also in daily use by the US Special Operations Command (USSOCOM).

(U) Mission Planning Systems are in budget activity 7, Operational System Development, because the program currently supports deployed AFMSS systems, which include transportables, non-deployable, and portable laptop workstations. AFMSS Block C1.5 software is operationally fielded and Block C2.0 is in the process of fielding to the Combat Air Forces (CAF). AFMSS Block C2.1, which merges USSOCOM and USAF requirements into one common software baseline is currently in final development and will begin operational test and evaluation in the 3rd quarter of FY98.

(U) **Acquisition Strategy:**

(U) The AFMSS program is managed by the Directorate for Mission Planning Systems, Electronic Systems Center, Hanscom AFB, Massachusetts. Contractor for the AFMSS project is Sanders, a Lockheed Martin Company, Nashua, New Hampshire. In-house (Government) work is performed by Oklahoma City-Air Logistics Center (OC-ALC), Tinker AFB, Oklahoma; Sacramento Air Logistics Center (SM-ALC), McClellan AFB, Sacramento, California; Warner Robins Air Logistics Center, (WR-ALC), Warner Robins AFB, Georgia; and Ogden Air Logistics Center (OO-ALC), Hill AFB, Utah.

(U) The Joint Mission Planning Segment (JMPS) is a continuation effort of the AFMSS Mission Planning Systems (MPS) and Portable Flight Planning Software (PFPS) directed at merging the AFMSS and the Navy's Tactical Automated Mission Planning System (TAMPS), to form a single family of systems achieving Global Command and Control System (GCCS) compatibility through compliance with the Defense Information Infrastructure and Common Operating Environment (DII/COE).

(U) JMPS is in the presolicitation phase. The current plan is to begin migration of the existing USAF platforms in the FY02-FY05 time frame while individual weapon systems transition with planned Operational Flight Program (OFP) upgrades.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		PROJECT
7 - Operational System Development	0208006F Mission Planning Systems	February 1998 3858
<p>(U) <u>FY 1997</u></p> <ul style="list-style-type: none"> - (U) \$14,991 Continue additional C2.0/C2.1 software requirements development. - (U) \$ 1,785 Continue AFMSS A/W/E support/integration to A/OA-10, F-15, F-16, F-22, EF-111, F-117, JSTARS, AWACS, ABCCC, AGM-130/GBU-15, JDAM, JSOW, B-1, B-2, B-52, KC-10, KC/EC/RC-135, C-5, C-9, C-21, C-17, C-141, MH/AH-6, MH-47, MH-53, MH-60, U-2, and C/AC/EC/MC-130, WCMD, and SR-71. - (U) \$ 830 Continue AFMSS/PC rearchitecture (GCCS) migration study effort. - (U) \$17,606 Total <p>(U) <u>FY 1998</u></p> <ul style="list-style-type: none"> - (U) \$ 6,493 Finalize C2.0/C2.1 Software development - (U) \$ 4,329 Begin C2.X software development. - (U) \$ 2,555 Begin JMPS rearchitecture (GCCS) migration effort. - (U) \$ 1,370 Continue AFMSS A/W/E support/integration to A/OA-10, F-15, F-16, F-22, EF-111, F-117, JSTARS, AWACS, ABCCC, AGM-130/GBU-15, JDAM, JSOW, B-1, B-2, B-52, KC-10, KC/EC/RC-135, C-5, C-9, C-21, C-17, C-141, MH/AH-6, MH-47, MH-53, MH-60, U-2, and C/AC/EC/MC-130, WCMD, and SR-71. - (U) \$14,747 Total <p>(U) <u>FY 1999</u></p> <ul style="list-style-type: none"> - (U) \$ 7,860 Continue C2.X development with release scheduled for 2nd quarter. - (U) \$ 7,860 Continue JMPS re-architecture (GCCS) migration. - (U) \$ 1,370 Continue AFMSS A/W/E support/integration to A/OA-10, F-15, F-16, F-22, EF-111, F-117, JSTARS, AWACS, ABCCC, AGM-130/GBU-15, JDAM, JSOW, B-1, B-2, B-52, KC-10, KC/EC/RC-135, C-5, C-9, C-17, C-21 C-141, MH/AH-6, MH-47, MH-53, MH-60, U-2, and C/AC/EC/MC-130, WCMD, and SR-71. - (U) \$17,090 Total 		
Project 3858	Page 2 of 8 Pages	Exhibit R-2 (PE 0208006F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0208006F Mission Planning Systems			PROJECT 3858	
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement, AF WSC 833040, Theater Air Control System Improvement (TACSI)	14,648	14,415	9,189	12,932	17,777	16,781	16,747	Cont	TBD
(U) Other Procurement, AF, WSC 86190A, Initial Spares	861	950	897	1079	1094	1107	1113	Cont.	TBD
(U) Operations & Maintenance, AF, 0208006F	18,398	23,064	25,038	24,923	28,356	25,044	26,611	Cont	TBD
<p>(U) O&M funds for PE 28006F support the software and hardware maintenance costs of AFMSS and CMPS. These funds also support the maintenance of the following existing operational systems until replaced by AFMSS: Mission Support System II (MSS IIA) supports existing combat capability for the F-15 and F-16 aircraft mission planning (F/RF-4 and F-111 are now retired); Mission Data Preparation System (MDPS) supports conventional and nuclear mission planning, aircraft/weapons avionics loading, compatibility between evolving B-1B, B-52H avionics, their weapons systems, and USSTRATCOM. O&M funding supported approximately 240 older systems in FY94. By FY99, a similar amount of funding will support over AFMSS 1500 mission planning systems world-wide.</p> <p>(U) There are no other related RDT&E activities for unit level mission planning in the USAF. Over 40 individual aircraft and weapons programs develop their respective software that is used in conjunction with the AFMSS core software. The aircraft and weapons software is a complimentary, synergistic effort that provides specific aircraft and weapons information and functionality to the core AFMSS software. The combined software gives the warfighter the full spectrum of mission planning and combat capabilities for their aircraft or weapon including interoperability with planned Theater Battle Management (TBM) systems.</p>									
Project 3858			Page 4 of 8 Pages				Exhibit R-2 (PE 0208006F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208006F Mission Planning Systems	PROJECT 3858
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) AFMSS Block C Workstation Deliveries		X							X			
(U) AFMSS Block C2.0 Software Release	X											
(U) AFMSS Block C2.1 Software Release					X							
(U) AFMSS Portable Deliveries	X				X	X				X		
(U) AFMSS Block C2.0 OT&E begin		X										
(U) AFMSS Block C2.X Software Development							X					
(U) AFMSS Block C2.X Engineering Software Releases / FQT					X				X			
(U) AFMSS Block C2.X Software Release										X		
(U) CMPS Software Delivery	X				X				X			
(U) JMPS Migration and Rearchitecture					X							X
GCCS Effort												
(U) AFMSS Block C2.1 OT&E Begin							X					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208006F Mission Planning Systems	PROJECT 3858
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Primary Software Development	12,184	9,101	10,802
(U) Aircraft/Weapons/Electronics (A/W/E) Development Spt.	1,352	1,032	1,162
(U) Systems Engineering	1,682	2,506	2,734
(U) Program Management	1,508	1,386	1,538
(U) Miscellaneous	880	722	854
(U) Total	17,606	14,747	17,090

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208006F Mission Planning Systems	PROJECT 3858
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
TBD	TBD	TBD			0	2,000	4,000	35,962		41,962
Lockheed Martin	CPAF	Dec 92	193,532	193,532	73,831	13,536	8,133	7,964		103,464
Logicon	CPAF	Aug 94	2,438	2,438	2,438	0	0	0	0	2,438
Boeing	FFP		6,455	6,455	6,455	0	0	0	0	6,455
Miscellaneous					2,892	0	0	0	0	2,892
ESC					15,296	880	722	854	2,624	20,376
<u>Support and Management Organizations</u>										
FFRDC					7,166	1,682	2,506	2,734	8,924	23,012
Miscellaneous					5,124	1,508	1,386	1,538	4,987	14,543
<u>Test and Evaluation Organizations</u>										
n/a	n/a	n/a	n/a	n/a	0	0	0	0	0	0

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE
BUDGET ACTIVITY			PE NUMBER AND TITLE			PROJECT
7 - Operational System Development			0208006F Mission Planning Systems			3858
Government Furnished Equipment:						
none						
Subtotal Product Development	100,912	14,416	10,855	12,818	38,586	177,587
Subtotal Support and Management	12,290	3,190	3,892	4,272	13,911	37,555
Subtotal Test and Evaluation	0	0	0	0	0	0
Total Project	113,202	17,606	14,747	17,090	52,497	215,142
Project 3858						
Page 8 of 8 Pages						
Exhibit R-3 (PE 0208006F)						

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208021F Information Warfare Support	PROJECT 0374
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COST (\$ In Thousands)	FY 1997 Estimate	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0374 Electronic Combat Support, C3 Protection/Multi-mission. Technology and Support	1,273	1,299	1,375	1,401	1,427	1,431	6,085	Continuing	Continuing

(U) **A. Mission Description and Budget Item Justification** This program studies, develops and demonstrates IW/C2W prototypes to provide warning, self protection, and support to personnel and equipment against combat systems employed by enemy forces. It identifies existing military and commercial research and development efforts which can satisfy unfulfilled operational requirements as identified by the Unified Commands, and quickly bridge the gap between technology developments and meld the technology into the warfighter's operational requirements. The Secretary of Defense identified the need for this capability in 1983, and with unanimous approval of the services and the Unified Commands, JCS made this function a part of the Joint Command and Control Warfare Center (JC2WC) mission (formerly the Joint Electronic Warfare Center (JEWEC)). The Air Force as executive agent is responsible for the total funding of this effort.

(U) **FY 1997 (\$ in Thousands):**

- (U) \$499 Joint Information Warfare project for JCS J-3
- (U) \$ 54 Demonstrate the capabilities of a previously developed system to several CINCs
- (U) \$720 Test and demonstrate Sounder
- (U) \$1273 Total

(U) **FY 1998 (\$ in Thousands):**

- (U) \$1299 The center has established a Joint Project Office (JPO) in response to recent tasking by the Joint Staff. This office will support the CINCs through rapid prototyping, briefings and demonstrations of state of the art technology currently under development. The Center will conduct field demonstrations of the operational utility of IW technologies projects. This will require coordination with the Joint Staff, CINCs, service acquisition command, laboratories, and various intelligence agencies. This will include IW source and target systems analysis, operations, and demonstration, and design, development and operations effectiveness assessment systems.
- (U) \$1299 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0208021F Information Warfare Support	0374
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$1375 The center has established a Joint Project Office (JPO) in response to recent tasking by the Joint Staff. The JPO office will support the CINCs through rapid prototyping, briefings and demonstrations of state of the art technology currently under development. The Center will conduct field demonstrations of the operational utility of IW technologies projects. This will require coordination with the Joint Staff, CINCs, service acquisition command, laboratories, and various intelligence agencies. This will include IW source and target systems analysis, operations, and demonstration, and design, development and operations effectiveness assessment systems.- (U) \$1375 Total- (U) Work performed by: The Joint Command and Control Warfare Center at Kelly AFB TX performs independent studies and analysis leading to development of Pre-Milestone Zero prototypes for field demonstrations and operations. When technology is available in Service and Industry labs, the JC2WC arranges for the development of a prototype and field demonstration of the prototype. Laboratories include Phillips Lab at Hanscom AFB MA, and Kirtland AFB NM, The Naval Research Lab, Washington DC. When required technologies are not available within DoD, JC2WC manages contractual efforts to produce, test and demonstrate prototypes. The Center also facilitates the exchange of information between the operators in the fleet and field and the laboratories, industry and Service program managers. The JC2WC currently has an Engineering Support Contract with Southwest Research Institute (SwRI), San Antonio TX, to perform engineering analysis and design, studies, reports, systems integration, fabrication, and software development. Under JC2WC leadership, the government and contractor labs work to deliver products that support the warfighting CINCs and address operations IW/C2W shortfalls.		
Project 0374	Page 2 of 3 Pages	Exhibit R-2 (PE 0208021F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208021F Information Warfare Support	PROJECT 0374	
(U) B. <u>Program Change Summary (\$ in Thousands)</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Previous President's Budget	1273	1360	1403
(U) Appropriated Value	1329	1360	
(U) Adjustments to Appropriated Value			
a. Cong Gen Reductions	-37	-44	
b. SBIR	-17	-17	
c. Omnibus or Other Above Threshold Reprogram			
d. Below Threshold Reprogramming	-2		
e. Recision			
(U) Adjustments to Budget Years Since FY 1998 PB			-28
(U) Current Budget Submit/President's Budget	1273	1299	1375
(U) Change Summary Explanation:			
Funding:			
Schedule:			
Technical: FY98 reduction eliminated development of a software measurement package, which handicaps the High Power Microwave project's weapon effects characterization.			
(U) C. <u>Other Program Funding Summary (\$0 in Thousands)</u>			
(U) none			
(U) D. <u>Schedule Profile</u>			
N/A			
Project 0374	Page 3 of 3 Pages	Exhibit R-2 (PE 0208021F)	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208031F WRM-Equipment/Secondary Items	PROJECT 4668
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4668 Shelter Development	0	0	1,470	1,493	1,517	2,632	2,862	0	9,974
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program funds development, testing and evaluation of materials, equipment, and procedures for Air Force Bare Base mobility capability better known as Harvest Falcon (HF) and Harvest Eagle (HE). Bare Base is designated and sized to support two near Major Theater Wars (MTW), which provides theater warfighters billeting, industrial, and air field capability to support a total of 68,200 combat troops, 822 aircraft at 15 austere locations... building complete bases from the ground up. Of the two systems, HF is the newest and has the greatest capability (housekeeping and airbase infrastructure). It is an outgrowth of the FY90-94 Defense Guidance that tasks the Air Force to support United States Central Command (USCENTCOM) Rapid Deployment Forces and save critical airlift resources through theater repositioning. The outstanding reputation of the Air Force Bare Base program, established during the Gulf War, has continued in successive Military-Operations-Other-Than-War (MOOTW) throughout the world. These include Operations Southern Watch, Provide Relief, Provide Promise, Provide Comfort, Restore Hope, Sea Signal, Uphold Democracy, and Joint Endeavor. Harvest Falcon remains a very top priority with USCINCENT. The Air Force Bare Base program has had unparalleled success meeting the demands in support of MOOTW. This has taken its toll on equipment and as a result the majority of HF and HE requires comprehensive repair or replacement. Equipment has been in use over three years... well beyond design parameters AF reconstitution efforts continue, on-going MOOTW deployments delay this process. This program is in Budget Activity 7 because it supports development of operational HF/HE equipment, leading to deployment of new systems which provide measurable reductions in airlift sorties and increased operational efficiencies.

Bare Base Systems Cold Weather Package: Harvest Falcon housekeeping sets are subject to worldwide deployment and a limited capability must be established to function in extreme cold weather conditions. This effort provides freeze protection for Harvest Falcon water distribution systems (pumps, pipes, etc.) and capabilities to heat tents/shelters deployed to extreme cold weather environments.

Deployable Waste Management Systems will reduce the amount of solid, medical and hazardous waste material that must be managed and/or disposed. Solutions to be investigated include on-site incineration for solid, medical and hazardous waste materials, shredders and compactors for landfill refuse, and a closed loop waste water processing system to minimize the quantity of wasted products and reduce the need for large quantities of water to process waste at the contingency base.

(U) Acquisition Strategy: The SPO will evaluate and test commercial solutions to determine options for militarizing commercially-available products. It will also evaluate work performed by Wright Laboratories, which has identified plasma-arc technology as a potential solution to safely, effectively and efficiently incinerate medical and hazardous wastes. This technology also provides capability to eliminate other waste materials, such as solid wastes/garbage, and other materials placed in landfills. Contracts expected to be competitive, firm fixed price.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0208031F WRM-Equipment/Secondary Items	4668
(U) <u>FY 1997 (\$ in Thousands):</u>		
- (U) \$ 0 TOTAL		
(U) <u>FY 1998 (\$ in Thousands):</u>		
- (U) \$ 0 TOTAL		
(U) <u>FY 1999 (\$ in Thousands):</u>		
- (U) \$ 600 Initiate EMD for Bare Base Systems Cold Weather Package		
- (U) \$ 600 Initiate EMD for Deployable Waste Management System		
- (U) \$ 270 Continue other technical support		
- (U) \$1,470 TOTAL		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0208031F WRM-Equipment/Secondary Items			PROJECT 4668		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>					
				<u>Cost</u>					
(U) Previous President's Budget	0	0	0	Cont					
(U) Appropriated Value									
(U) Adjustments to Appropriated Value									
a. Congressional Gen Reductions									
b. SBIR									
c. Omnibus or Other Above Threshold Reprogramming									
d. Below Threshold Reprogramming									
e. Rescissions									
(U) Adjustments to Budget Years Since FY 1998 PB			1,470						
(U) Current Budget Submit/1999 PB	0	0	1,470	Cont					
 (U) Change Summary Explanation:									
Funding: FY99 new start of \$1.470M to fund crucial capabilities for HF/HE deployment kits.									
Schedule: EMD to begin in FY99. Production of first end item anticipated in FY01.									
Technical: New start -- no change to report.									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) Other Procurement, AF, Other Base Maintenance and Support Program:									
WRM-Equipment/Secondary Items (0208031F)	21,478	24,048	35,973	35,757	37,667	13,179	13,423	Cont	Cont
(WSC 845420), P-1: 99									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208031F WRM-Equipment/Secondary Items	PROJECT 4668
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Contracts	0	0	550
(U) A&AS Support	0	0	450
(U) Other Government Agencies			180
(U) Material/Equipment			20
(U) Other Technical Support			270
(U) Total	0	0	1,470

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208031F WRM-Equipment/Secondary Items	PROJECT 4668
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Bare Base Systems Cold Weather Package	TBD	TBD	2,250	2,250	0	0	0	600	Cont	Cont
Deployable Waste Management System	TBD	TBD	7,940	7,940	0	0	0	600	Cont	Cont
Sub-Total			10,190	10,190	0	0	0	1,200	Cont	Cont
Support and Management Organizations					0	0	0	270	Cont	Cont
Test and Evaluation Organizations: N/A										

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208031F WRM-Equipment/Secondary Items	PROJECT 4668
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Government Furnished Property: None

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208060F Theater Missile Defense
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	21,740	26,873	31,057	29,605	32,394	27,390	24,069	Continuing	TBD
4478 Command, Control, Communications, Computers, and Intelligence Enhancements	13,015	19,288	23,123	21,229	23,479	17,264	14,026	Continuing	TBD
4479 Attack Operations Concept Development	8,725	7,585	7,934	8,376	8,915	10,126	10,553	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Air Force Theater Missile Defense (TMD) is focused in two areas: Command, Control, Communications, Computers, and Intelligence (C4I) enhancements and improvements to existing Attack Operations systems. AF TMD concentrates on defining improvements to existing operational capabilities, developing and evaluating prototypes, demonstrating as well as simulating modifications during operational concept demonstrations, and coordinating the transition of these capabilities to operational systems. C4I improvements contribute greatly to the overall effectiveness of TMD systems developed by each of the Services and the Ballistic Missile Defense Organization (Patriot, THAAD, etc.). C4I enhancements improve our ability to assess, target, plan and task attackers to counter Theater Missile (TM) threats. The C4I program encompasses JTIDS TMD Upgrades (including, for example, TMD Message Set Integration and JTIDS Range Extension), Dynamic Battle Management, Operations Decision Tools (Time Critical Target Aid (TCTA), Joint Defensive Planner, Attack Operations Decision Aid (AODA), Integrated Surveillance System (ISS), Communications Planning Module (CPM), Intel Support Systems (Intel Support Concept, Operational Intel and support tools) and integration of these systems within the Air Force and among the Services. Attack Operations focuses on improving the ability to locate, identify, target and destroy theater missiles and supporting infrastructure, including theater missile threats in production, deployment, prior to and during launch, as well as soon after launch before critical mobile targets are able to egress to hide locations. The foundation for Attack Operations is improved C4I and automatic target cueing/recognition (ATC/R) upgrades to one or more airborne platforms (Joint STARS, F-15E, Rivet Joint, U-2). The TMD program seeks to improve existing operational capability, evaluate and demonstrate prototypes, as well as simulate and demonstrate modifications during operational concept demonstrations. This program is in Budget Activity 7 because its projects are upgrades to existing operational systems.

(U) Acquisition Strategy: HQ Avionics Systems Center (ASC) provides the program management for the concept exploration of TMD Attack Operations. ASC conducts lab demonstrations with Wright Labs and supports Concept of Operations (CONOPS) development and requirements definition by analyzing and demonstrating measures of effectiveness for various sensor improvements and cueing schemes. HQ Electronic Systems Center (ESC) provides program management for the concept exploration of C4I enhancements. Prototypes and analysis of improvements to existing C4I assets will complement the Attack Operations effort with combined participation in Operational Concept Demonstrations. These Attack Operations and C4I analyses and demonstrations are specifically targeted against operational deficiencies identified in the TMD Mission Area Plan (MAP), are traceable to the AF and JROC Mission Need Statement (MNS) and are consistent with the Air Force and Joint TMD CONOPS and in accordance with Joint Doctrine. Integration of TMD requirements and fielding of proposed material solutions will continue beyond concept exploration in the

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208060F Theater Missile Defense																																																								
<p>appropriate program element for a particular system. For example, the TMD demonstration and requirements analysis for F-15E ATC/R may transition into a F-15E Engineering & Manufacturing Development (EMD) and P3I project within the F-15E program element. Existing contracts will be used for those systems where engineering change proposals are appropriate. Systems Engineering and Technical Analysis (SETA) contracts will be used to support the requirements definition phase of TMD improvements. In those areas where new material solutions are necessary to correct a deficiency, the source selection process will be followed to establish a new contract.</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 35%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget</td> <td style="text-align: right;">30,585</td> <td style="text-align: right;">29,182</td> <td style="text-align: right;">31,682</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">31,285</td> <td style="text-align: right;">28,182</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional General Reductions</td> <td style="text-align: right;">-700</td> <td style="text-align: right;">1,727</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. Small Business Innovative Research (SBIR)</td> <td></td> <td style="text-align: right;">-582</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td style="text-align: right;">-8,794</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: right;">-51</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td style="text-align: center;">0</td> <td></td> <td style="text-align: right;">-625</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">21,740</td> <td style="text-align: right;">26,873</td> <td style="text-align: right;">31,057</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: FY97 realignment for UH-1N Simulator integration into the TACCSF simulation environment; funds realigned from 3600 to 3010 and transferred to Aircraft Procurement Post Production Charges - BP13.</p> <p>Schedule: N/A</p> <p>Technical: N/A</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>: See individual projects.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget	30,585	29,182	31,682	TBD	(U) Appropriated Value	31,285	28,182			(U) Adjustments to Appropriated Value					a. Congressional General Reductions	-700	1,727			b. Small Business Innovative Research (SBIR)		-582			c. Omnibus or Other Above Threshold Reprogram	-8,794				d. Below Threshold Reprogramming					e. Rescissions	-51				(U) Adjustments to Budget Years Since FY 1998 PB	0		-625		(U) Current Budget Submit/FY 1999 President's Budget	21,740	26,873	31,057	TBD
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<i>Page 2 of 15 Pages</i>		Exhibit R-2 (PE 0208060F)																																																							

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208060F Theater Missile Defense
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) ATC/R Demos (F-15E/Surveillance)			X	X								X
(U) TPS-75 Expert Missile Tracker Prototypes/Contingency Support Systems Live Fire Demo												X
(U) TACCSF				X								
(U) Intel Support Systems: ISC updates; Syria, Iran, and Iraq, and automation of country studies				X								
(U) TMD TACS systems requirements (JTIDS message upgrades, decision aids & planning tools)			X					X				X
(U) Ops Concept Demonstrations			X					X			X	

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BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0208060F Theater Missile Defense				PROJECT 4478							
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost						
4478 Command, Control, Communications, Computers, and Intelligence Enhancements	13,015	19,288	23,123	21,229	23,479	17,264	14,026	Continuing	TBD						
<p>(U) A. <u>Mission Description and Budget Item Justification</u> C4I enhancements are needed to reduce the battle management and command & control timelines associated with the theater missile threat. The C4I program includes:</p> <ol style="list-style-type: none"> 1) Operations and maintenance of the Theater Air Command and Control Simulation Facility (TACCSF) - FY98 transition to PE 27601F; 2) Procurement of four MCE/TPS-75 prototypes with expert missile tracker (EMT), correlator capability and live fire demo; 3) Intel Support Systems which include the development and revision of the Intel Support Concept (ISC), digitization of the country studies and development of processes and tools for automated application of TMD Intelligence Preparation of the Battlespace (IPB); 4) JTIDS TMD upgrades which are the development and integration of TMD messages into JTIDS host platforms and the extension of JTIDS beyond line of sight; 5) Operations Decision Support Tools which include the integration of the Time Critical Target Aid into TBM Core Systems (TBMCS) architecture, the development and migration of the Joint Defensive Planner into TBMCS and initiating the development of the Attack Operations Decision Aid and Communications Planning Module. 6) Dynamic Battle Management concept, which enhances the forward execution capabilities of the TACS to counter the short timeline of time critical targets. This includes the development, integration and test of the DBM capability on an airborne platform. The program will leverage off the capabilities of the current ground Combat Integration Capability (CIC) program which integrates and fuses various intelligence and surveillance feeds to provide the Joint Force Commander (JFC)/Joint Force Air Component Commander (JFACC) with an effective battle management capability. <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <table style="width:100%; border: none;"> <tr> <td style="width:10%;">(U) 6,055</td> <td>Completed TACCSF operations support for C4I simulation and analysis.</td> </tr> <tr> <td>(U) 3,000</td> <td>Continued MCE/TPS-75 missile tracker and correlator capability development.</td> </tr> <tr> <td>(U) 1,300</td> <td>Intel Support Systems - Developed Intelligence Support Plan for Combat Integration Capability (CIC); Continued development of tool for automatic application of digitized TMD IPB information.</td> </tr> </table>										(U) 6,055	Completed TACCSF operations support for C4I simulation and analysis.	(U) 3,000	Continued MCE/TPS-75 missile tracker and correlator capability development.	(U) 1,300	Intel Support Systems - Developed Intelligence Support Plan for Combat Integration Capability (CIC); Continued development of tool for automatic application of digitized TMD IPB information.
(U) 6,055	Completed TACCSF operations support for C4I simulation and analysis.														
(U) 3,000	Continued MCE/TPS-75 missile tracker and correlator capability development.														
(U) 1,300	Intel Support Systems - Developed Intelligence Support Plan for Combat Integration Capability (CIC); Continued development of tool for automatic application of digitized TMD IPB information.														
Project 4478		Page 4 of 15 Pages				Exhibit R-2 (PE 0208060F)									

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(U) 2,660	JTIDS TMD message integration into JSTARS, ABCCC and AOC; Completed JTIDS Range Extension performance and cost analysis; Continued development of TCTA (DIS compatible) and DPM V1.0 and transitioned to TBMCS; Completed DBM trade and analysis/platform impacts and CONOPS validation; Investigated procedures and advanced technology for Attack Operations Decision Aid (AODA).	
(U) \$13,015	Total	
<u>(U) FY 1998 (\$ in Thousands):</u>		
(U) 2,810	Integrate Intelligence Preparation of the Battlespace (IPB) Tool with TBMCS; Adapt IPB tool for Air Intelligence Agency's Virtual Production environment; Investigate area limitation functionality and tool integration, Demonstrate automated procedures and system capabilities in Ops Concept Demonstrations, CINC experiments and Joint Exercises.	
(U) 1,000	Conduct MCE/TPS-75 Missile Tracking Live Fire Test and final delivery.	
(U) 8,078	Continue to integrate JTIDS TMD message sets into JTIDS host platforms; Begin JTIDS Range Extension prototype development and implementation; Establish Airborne DBM development environment and DBM unique prototyping/technology development; Initiate Communications and architecture analyses.	
(U) 7,400	Integrate JDP V1.0 and TCTA (ground targeting) with TBMCS and release; Begin AODA prototype/technology development. Explore use of promising planning tools, C2 decision aids, communication and computer processing improvements, sensor fusion technology and sensor upgrade impacts to BMC4I Theater Missile Defense connectivity.	
(U) \$19,288	Total	
<u>(U) FY 1999 (\$ in Thousands):</u>		
(U) 4,350	Continue to adapt the IPB tool for Air Intelligence Agency's Virtual Production environment; Demonstrate improved automated procedures and IPB system capabilities in Ops Concept Demonstrations (OCDs), CINC experiments and Joint Exercises.	
(U) 8,860	JTIDS/Link-16 Integration: Complete integration of JTIDS/Link-16 TMD message sets onto major C2 nodes; Continue JTIDS Range Extension implementation.	
(U) 9,913	Operations Decision Support Tools - Upgrade JDP (deployment planner), continue to explore BMC4I/sensor improvements that compress Theater Missile engagement timelines and demonstrate integrated capabilities in OCDs, CINC experiments, and Joint Exercises. DBM platform prototypes: battle management, target nomination and communication improvements; Complete AODA prototype/technology development and design for CIC integration.	
(U) \$23,123	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208060F Theater Missile Defense	PROJECT 4478
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	21,860	21,162	23,588	TBD
(U) Appropriated Value	21,860	21,162		TBD
(U) Adjustments to Appropriated Value				
a. Congressional General Reductions	-514	-1,456		
b. Small Business Innovative Research (SBIR)		-418		
c. Omnibus or Other Above Threshold Reprogram	-8,794			
d. Below Threshold Reprogramming				
e. Rescissions	-51			
(U) Adjustments to Budget Years Since FY 1998 PB			-465	
(U) Current Budget Submit/FY 1999 President's Budget	13,015	19,288	23,123	TBD

(U) Change Summary Explanation:

Funding: FY97 realignment for integration of UH-1N Simulator into the TACCSF simulation environment; funds realigned from 3600 to 3010 and transferred to Aircraft Procurement Post Production Charges - BP13.

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary (\$ in Thousands):

	FY1997	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	To Complete	Total Cost
RDT&E, BMDO PMA F3261, BM/C4I	13,115	12,654	11,701	5,938	4,958	10,706	10,736	TBD	TBD

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208060F Theater Missile Defense	PROJECT 4478
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(U) **D. Schedule Profile:**

	<u>FY1997</u>				<u>FY1998</u>				<u>FY1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) TPS-75 Expert Missile Tracker Prototypes/Contingency Support Systems				X	X							
(U)TACCSF				X								
(U) Intel Support Systems: ISC updates; Syria, Iran, and Iraq, and automation of country studies				X					X			
(U) TMD TACS systems requirements (JTIDS message upgrades, decision aids & planning tools)			X				X				X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0208060F Theater Missile Defense	PROJECT 4478
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(U) A. Project Cost Breakdown (\$0 in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) TACCSF	6,055	0	0
(U) Intelligence Support Systems (ISC/Automated IPB)	1,300	2,810	4,350
(U) MCE/TPS-75 Missile Tracking System	3000	1,000	0
(U) JTIDS/Link-16 Integration & Beyond LOS Capability	520	5,645	8,860
(U) Dynamic Battle Management (DBM)	300	3,270	6,378
(U) Operations Decision Support Tools (planning tools, decision aids, C4I processing and sensor fusion technologies)	1,840	6,563	3535
(U) Total	13,015	19,288	23,123

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0208060F Theater Missile Defense				PROJECT 4478	
<u>(U) B. Budget Acquisition History and Planning Information (\$0 in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Martin Marietta (TACCSF)	FFP	Oct 95	N/A	N/A	9,100	6,055	0	0	0	15,155
North/Grumman (TPS-75)	FFP	Oct 95	N/A	N/A	0	2,142	1,000	0	0	3,142
Zeltech/SPARTA PSR (IPB)	T&M	May 96	N/A	N/A	500	830	2,294	3,693	Continuing	7,317
Alphatech (JDP)	T&M	Mar 95	N/A	N/A	0	840	0	0	0	840
Boeing (DBM)	T&M	Dec 97	N/A	N/A	0	0	500	1,500	Continuing	2,000
Northrop Grumman (DBM)	T&M	Dec 97	N/A	N/A	0	0	500	1,500	Continuing	2,000
BDM (DBM) For Profit Contractor (DBM)	T&M	Nov 97	N/A	N/A	0	0	250	330	Continuing	580
For Profit Contractor (DBM)	T&M	Jan 98	N/A	N/A	0	0	731	1,135	Continuing	1,866
Motorola (TCTA)	T&M	Mar 96	N/A	N/A	0	885	516	0	0	1,401
LMCCS (JDP) For Profit Contractor (AODA)	T&M	Oct 97	N/A	N/A	0	0	1,400	0	0	1,400
For Profit Contractor (AODA)	TBD	Oct 97	N/A	N/A	0	0	1,316	2,100	Continuing	3,416
For Profit Contractor (MSI)	TBD	Dec 97	N/A	N/A	0	0	1,049	350	Continuing	1,399
Lock/Mart (MSI)	T&M	Mar 97	N/A	N/A	0	50	0	0	0	50

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BUDGET ACTIVITY
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PE NUMBER AND TITLE
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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
For Profit Contractor (CPM)	T&M	Oct 97	N/A	N/A	0	0	93	500	Continuing	593
For Profit Contractor (Analyses)	TBD	Nov 97	N/A	N/A	0	0	160	1,194	Continuing	1,354
MASC For Profit Contractor (JRE)	T&M	Nov 96	N/A	N/A	0	370	0	0	Continuing	370
	TBD	Oct 97	N/A	N/A	0	0	2,619	5,152	Continuing	7,771
<u>Support and Management Organizations</u>										
FFRDC			N/A	N/A	1,605	975	1,994	2,054	Continuing	6,628
Non-FFRDC (ESC)			N/A	N/A	1,935	534	1,040	1,071	Continuing	4,580
Non-FFRDC (ACC)			N/A	N/A	0	0	1,640	540	Continuing	2,180
Non-FFRDC (XORFS)			N/A	N/A	0	0	900	927	Continuing	1,827
HQ ESC			N/A	N/A	2,251	334	1,286	1,077	Continuing	4,948
<u>Test and Evaluation Organizations</u>										

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Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
TBD										
<u>Government Furnished Property</u>										
None										
Subtotal Product Development 50,659					9,600	11,172	12,428	17,454	Continuing	
Subtotal Support and Management 20,163					5,791	1,843	6,860	5,669	Continuing	
Subtotal Test and Evaluation 0					0	0	0	0	0	
Total Project					15,391	13,015	19,288	23,123	Continuing 70,817	

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BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0208060F Theater Missile Defense				PROJECT 4479		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
4479 Attack Operations Concept Development	8,725	7,585	7,934	8,376	8,915	10,126	10,553	Continuing	TBD	
(U) A. <u>Mission Description and Budget Item Justification</u>										
Improvements in Attack Operations are based on the ability to locate, identify, and destroy theater missiles, their launchers, and associated infrastructure on the ground. In addition to the enhancements to C4I, the Attack Operations Project focuses on advanced sensor and target identification capabilities, CONOPS and requirements development for TMD offensive counter-air and their optimized integration with defensive systems. Specific technologies such as automatic target cueing/recognition (ATC/R) and moving target indicator/track (MTI/T) upgrades to Joint STARS, F-15E and potentially the U-2, F-16 and UAVs are to be analyzed using constructive analysis and evaluated through Technology/Operational Concept Demonstrations and CINC Experiments along with command and control connectivity upgrades critical to their optimum employment against time-critical targets. Effectiveness and affordability parameters defined will be used in support of follow on acquisition decisions involving P3I upgrades to existing weapon systems and potential new start programs within existing/other program elements.										
(U) <u>FY 1997 (\$ in Thousands):</u>										
(U) 1,190 Conducted demonstration of surveillance ATR prototype.										
(U) 3,367 Conducted Attack Operations Operational Concept Demonstration.										
(U) 1,528 Continued analysis of architectures with weapon system upgrades, improved model fidelity and threat scenarios.										
(U) 2,640 Conducted demonstration of F-15E ATC/R prototype.										
(U) \$8,725 Total										
(U) <u>FY 1998 (\$ in Thousands):</u>										
(U) 2,033 Conduct Attack Operations Operational Concept Demonstration.										
(U) 1,650 Continue analysis of architectures with weapon system and BMC4I upgrades, incorporate model and threat scenario upgrades and perform engagement analyses for input to future year mission analysis.										
(U) 3,902 Conduct development of F-15E ATC/R prototype integrated with improved on/off-board sensor fusion.										
(U) \$7,585 Total										
(U) <u>FY 1999 (\$ in Thousands):</u>										
(U) 2,298 Conduct Attack Operations Operational Concept Demonstration.										
(U) 1,755 Continue analysis of updated architectures with weapon system and BMC4I upgrades, incorporate obscured targets and weapon effects and perform engagement analyses for input to future year mission analysis.										
(U) 3,881 Conduct demonstration of F-15E ATC/R prototype with sensor fusion.										
(U) \$7,934 Total										
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(U) B. <u>Program Change Summary (\$ in Thousands)</u>													
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>							
						<u>Cost</u>							
(U) Previous President's Budget		8,725	8,020	8,094		TBD							
(U) Appropriated Value		8,911	8,020			TBD							
(U) Adjustments to Appropriated Value													
a. Congressional General Reductions		-186	-271										
b. SBIR			-164										
c. Omnibus or Other Above Threshold Reprogram													
d. Below Threshold Reprogramming													
e. Rescissions													
(U) Adjustments to Budget Years Since FY 1998 PB				-160									
(U) Current Budget Submit/FY 1999 President's Budget		8,725	7,585	7,934		TBD							
(U) Change Summary Explanation:													
Funding: Change in FY97 due to payment of Air Force Bills. Changes in FY98 and FY99 were due to deletion of Link-16 integration in the F-15E.													
Schedule: The deletion of Link-16 integration in the F-15E from this PE will delay implementation of a datalink capability in air to ground aircraft until the planned integration under the F-15E program (after FY00).													
Technical: N/A													
(U) D. <u>Schedule Profile:</u>													
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
		1	2	3	4	1	2	3	4	1	2	3	4
(U) ATC/R Demos (F-15E/Surveillance)				X	X			X					X
(U) Ops Concept Demonstrations				X				X				X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0208060F Theater Missile Defense			PROJECT 4479		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Joint STARS ATC/R Demonstration/Improvements					1,190	0	0			
(U) Operational Concept Demonstration					3,367	2,033	2,298			
(U) Sensor Prototypes and Attack Ops Demonstrations/Sims					1,528	1,650	1,755			
(U) F-15E ATC/R Demonstrations					2,640	3,902	3,881			
(U) Total					8,725	7,585	7,934			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Boeing	CPFF	Aug 94	N/A	N/A	772	0	0	0	0	772
Boeing	CPFF	30 May 86	N/A	N/A	890	0	0	0	0	890
Geometric	CPFF	Mar 95	N/A	N/A	65	0	0	0	0	65
Hughes-FD	CPFF	Mar 95	N/A	N/A	1,234	350	3,006	1,665	Continuing	6,255
Norden	CPFF	Sep 94	N/A	N/A	540	0	0	0	0	540
Veda	CPFF	Feb 95	N/A	N/A	200	0	0	0	0	200
Lincoln Lab	MIPR	Mar 95	N/A	N/A	100	0	0	0	0	100
Sverdrup	CPFF	Mar 95	N/A	N/A	565	0	0	0	0	565
HSC/AL	MIPR	Aug 94	N/A	N/A	2,470	985	0	0	0	3,455
Sandia Nat Labs	MIPR	Mar 95	N/A	N/A	8,586	240	0	0	0	8,826
Lockheed Martin	MIPR	TBD	N/A	N/A	0	1,825	746	1,521	Continuing	4,092
Project 4479					Page 14 of 15 Pages			Exhibit R-3 (PE 0208060F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0208060F Theater Missile Defense					PROJECT 4479
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Optimetrics	CPFF	TBD	N/A	N/A	0	0	0	150	Continuing	150
ESC//JTF	MIPR	TBD	N/A	N/A	0	600	0	0	0	600
Grumman	MIPR	Sep 96	N/A	N/A	0	350	0	0	0	350
ACC/XPSAS	MIPR	TBD	N/A	N/A	0	0	500	505	Continuing	1,005
WL/AAZ	MIPR	TBD	N/A	N/A	0	96	0	0	0	96
WL/AAR	MIPR	TBD	N/A	N/A	0	0	650	675	Continuing	1,325
AL/CFHI	MIPR	TBD	N/A	N/A	0	0	365	585	Continuing	950
WL/AAJT	MIPR	TBD	N/A	N/A	0	0	0	112	Continuing	112
<u>Support and Management Organizations</u>										
FFRDC			N/A	N/A	757	648	210	230	Continuing	1,845
Non-FFRDC			N/A	N/A	471	355	160	192	Continuing	1,178
HQ ASC			N/A	N/A	561	960	948	559	Continuing	3,028
<u>Test and Evaluation Organizations</u>										
28 Test/TOT	MIPR	Mar 95	N/A	N/A	17	1,316	950	1,040	Continuing	3,323
AFSAA	MIPR	Feb 95	N/A	N/A	350	0	0	0	0	350
Eglin-46 Tst Wg		May 94	N/A	N/A	5,296	1,000	50	700	Continuing	7,046
<u>Government Furnished Equipment</u>										
None										
Subtotal Product Development					15,422	4,446	5,267	5,213	Continuing	30,348
Subtotal Support and Management					1,789	1,963	1,318	981	Continuing	6,051
Subtotal Test and Evaluation					5,663	2,316	1,000	1,740	Continuing	10,719
Total Project					22,874	8,725	7,585	7,934	Continuing	47,118

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0302015F E-4B National Airborne Operations Center (NAOC)	PROJECT 4777
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4777 E-4B Aircraft Modernization	0	0	4,233	17,570	36,622	25,113	4,260	0	87,798
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: Project 4777 is an FY 99 new start.

(U) A. Mission Description and Budget Item Justification

(U) This program encompasses essential infrastructure, mission equipment and interior upgrades to the E-4 Aircraft which is the airframe of the National Airborne Operational Center (NAOC). The NAOC supports the National Command Authority (NCA) and Joint Chiefs of Staff with a worldwide, survivable and enduring node of the National Military Command System (NMCS) for the exercise of their national security responsibilities throughout the full spectrum of conflict. These modifications will improve mission efficiency and effectiveness by upgrading aircraft systems and interior configurations to allow a better interface with current off-aircraft communications systems. Interior upgrades will reduce noise and increase workspace efficiency. This program is in budget activity 7 because the program is developing modifications for current operations systems.

(U) Acquisition Strategy:

Boeing OEM owns rights to all drawings on this aircraft under an existing Engineering Services Time and Materials contract and therefore will build the A & B specifications (When restricted technologies are involved, foreign competition is not allowed). All other contracts will be Cost Plus Award Fee (CPAF) types, Cost Plus Incentive Fee (CPIF), or a hybrid of the two types of contracts.

(U) FY 1997 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

– (U) \$0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0302015F E-4B National Airborne Operations Center (NAOC)	PROJECT 4777																																																		
<p>–</p> <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$ 2,091 Trade Studies(e.g., E-4B modification and GANS/GATM Analysis) – (U) \$ 2,092 Begin Developing A & B Specs – (U) \$ 50 Mission Support – (U) \$4,233 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> </tr> <tr> <td>(U) Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">4,233</td> <td style="text-align: center;">0</td> </tr> <tr> <td>(U) Current Budget Submit/ FY 1999 President's Budget</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">4,233</td> <td style="text-align: center;">87,798</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: FY 99 and out is included in the budget as a new start activity</p> <p style="padding-left: 20px;">Schedule: None</p> <p style="padding-left: 20px;">Technical: None</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget	0	0	0	0	(U) Appropriated Value					(U) Adjustments to Appropriated Value					a. Cong Reductions					b. SBIR					c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					(U) Adjustments to Budget Years Since FY 1998 PB	0	0	4,233	0	(U) Current Budget Submit/ FY 1999 President's Budget	0	0	4,233	87,798
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																
(U) Previous President's Budget	0	0	0	0																																																
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(U) Current Budget Submit/ FY 1999 President's Budget	0	0	4,233	87,798																																																
Project 4777	Page 2 of 5 Pages	Exhibit R-2 (PE 0302015F)																																																		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0302015F E-4B National Airborne Operations Center (NAOC)	PROJECT 4777

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>FY 2005</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U)) E-4B Major Modification, PE 0302015F	13,379	13,987	26,938	35,290	14,625	35,042	0	0	28,125	167,386

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Begin Trade Studies									X			
(U) Begin Development of A & B Specs										X		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0302015F E-4B National Airborne Operations Center (NAOC)			PROJECT 4777		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	System Engineering (Recurring and Non-recurring)				0	0	2,041			
(U)	Primary Hardware (Kits, Initial Spares, etc.)				0	0	2,042			
(U)	Mission Support				0	0	150			
(U)	Total				0	0	4,233			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Boeing	CPAF/CPIF	TBD	TBD	TBD	0	0	0	3,733	74,625	78,358
<u>Support and Management Organizations</u>										
TRW/ANSER	T & M	TBD	TBD	TBD	0	0	0	350	8,220	8,570
Misc.	Misc.	TBD	TBD	TBD	0	0	0	150	680	830
<u>Test and Evaluation Organizations</u>										
NSA/FAA	MIPR	TBD	TBD	TBD	0	0	0	0	40	40
Government Furnished Property: None										
Project 4777					Page 4 of 5 Pages			Exhibit R-3 (PE 0302015F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0302015F E-4B National Airborne Operations Center (NAOC)				PROJECT 4777	
<u>Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>		None							
<u>Support and Management Property</u>		None							
<u>Test and Evaluation Property</u>		None							
Subtotal Product Development				0	0	0	3,733	74,625	78,358
Subtotal Support and Management				0	0	0	500	8,900	9,400
Subtotal Test and Evaluation				0	0	0	0	40	40
Total Project				0	0	0	4,233	83,565	87,798

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303110F Def Satellite Comm Sys (Space)	PROJECT 2638
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2638 Defense Satellite Communications Sys	30,098	9,961	15,641	9,149	8,756	2,963	2,220	5,200	633,415
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

(U) Defense Satellite Communications System (DSCS) is the backbone of the Government’s satellite communications system, providing both secure voice and high data rate transmissions in the SHF frequency band. DSCS provides unique and vital national security communications for global command and control, crisis management, intelligence and early warning data relay, treaty monitoring and surveillance information, and diplomatic traffic. The communications relayed through DSCS support the National Command Authorities, Global Command and Control System, Diplomatic Telecommunications Service, White House Communications Agency, the Navy, the Air Force Satellite Control Network, and ground mobile forces of all services.

(U) Based on the DoD Space Architect’s recommendation, the Service Life Enhancement Program (SLEP) will include additional modifications that increase the last four satellites’ capacity to tactical users by more than 200%.

(U) This program is in Budget Activity 7, Operational System Development, because DSCS is a production system consisting of a fully operational satellite constellation and replenishment satellites awaiting launch.

(U) Acquisition Strategy:

All satellites have been acquired and four satellites remain to launch. Enhancements to satellites not launched will be accomplished through sole source contract awards.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,898 Continued DSCS mission support activities
 - Supported program office operations
 - Conducted programmatic tradeoffs and analyses
 - Paid performance incentives for development satellites that are still on orbit and operational

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0303110F Def Satellite Comm Sys (Space)	2638
<ul style="list-style-type: none"> - (U) \$27,200 Continued SLEP modification <ul style="list-style-type: none"> - Completed system Critical Design Review (CDR) - Fabricated and assembled components for first article insertion - Continued to develop Low Noise Amplifier (LNA) upgrade to enhance performance and increase capacity for tactical users - Continued to develop satellite bandwidth modifications to increase capacity level of less capable DSCS satellites to that of satellites B8 - B14 - Continued to develop modification kits for variable gain step attenuator and channel 5 switch to gimbaled dished antenna (GDA) - (U) \$30,098 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,311 Continue DSCS mission support activities <ul style="list-style-type: none"> - Support program office operations - Conduct programmatic tradeoffs and analyses - Pay performance incentives for development satellites that are still on orbit and operational - (U) \$5,000 Continue SLEP modification <ul style="list-style-type: none"> - Conduct final assembly of first article - Conduct SLEP rework verification test - Continue LNA upgrade development to enhance performance and increase capacity for tactical users - Continue to develop satellite bandwidth modifications to increase capacity level of less capable DSCS satellites to that of satellites B8 - B14 - (U) \$1,650 - Begin integration development to transition last two satellites to Evolved Expendable Launch Vehicles (EELVs) - (U) \$9,961 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,591 Continue DSCS mission support activities <ul style="list-style-type: none"> - Support program office operations - Conduct programmatic tradeoffs and analyses - Pay performance incentives for development satellites that are still on orbit and operational - Investigate and develop DSCS III performance enhancements - (U) \$12,050 - Continue integration development to transition last two satellites to EELVs - (U) \$15,641 Total 		
Project 2638	Page 2 of 6 Pages	Exhibit R-2 (PE 0303110F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303110F Def Satellite Comm Sys (Space)	PROJECT 2638
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Program</u>
(U) Previous President's Budget (FY 1998 PB)	27,279	10,547	17,589	634,014
(U) Appropriated Value	28,127	10,547		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-589	-345		
b. SBIR	-259	-241		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	2,869			
e. Rescissions	-50			
(U) Adjustments to Budget Years Since FY 1998 PB			-1,948	
(U) Current Budget Submit/FY 1999 President's Budget	30,098	9,961	15,641	633,415

(U) Change Summary Explanation:
 Funding: \$2,869 FY 1997 BTR from PE 0305144F completes the development of the Service Life Enhancement Kit for the first modified DSCS satellite.

Schedule: None

Technical: None

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303110F Def Satellite Comm Sys (Space)	PROJECT 2638
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>
(U) Missile Procurement, P-27	28,627*	73,980	28,969	31,283	23,412	27,714	23,646	73,500	1,906,531

* Includes \$13.5 million advanced procurement for SLEP.

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Launch DSCS/IABS 7 (Jul 99)												X
(U) Launch DSCS/IABS 8 (May 00)												
(U) Launch DSCS/IABS 9 (May 02)												
(U) Launch DSCS/IABS 10 (May 03)												
(U) SLEP Modification Program (Mar 96 - Aug 00)												
(U) SLEP CDR (Mar 97)		X										
(U) EELV Integration (May 98 - Jan 00)												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303110F Def Satellite Comm Sys (Space)			PROJECT 2638		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Basic Program Activities				2,898	3,311	3,591			
(U)	SLEP				27,200	5,000	0			
(U)	EELV				0	1,650	12,050			
(U)	Total				30,098	9,961	15,641			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997*	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Lockheed Martin	FFP/AF	Oct 84	437,500	437,500	404,637	28,798	6,697	1,591	4,100	445,823
Miscellaneous	CPAF	Various	N/A	N/A	124,978	0	1,650	12,050	800	139,478
<u>Support and Management Organizations</u>										
Aerospace Corp	PO	Various	N/A	N/A	12,900	0	0	0	0	12,900
Miscellaneous	Various	Various	N/A	N/A	10,000	1,300	1,614	2,000	20,300	35,214
<u>Test and Evaluation Organizations</u>										
None										
* Tracked back to FY86. All other prior year funds included in the Miscellaneous line for Product Development Organizations.										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303110F Def Satellite Comm Sys (Space)			PROJECT 2638		
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>									
Government Furnished Property: None									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
N/A									
<u>Support and Management Property</u>									
N/A									
<u>Test and Evaluation Property</u>									
N/A									
Subtotal Product Development				529,615	28,798	8,347	13,641	4,900	585,301
Subtotal Support and Management				22,900	1,300	1,614	2,000	20,300	48,114
Subtotal Test and Evaluation									
Total Project				552,515	30,098	9,961	15,641	25,200	633,415

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	23,307	32,399	39,230	44,743	13,332	1,756	1,213	Continuing	Continuing
2832 VLF/LF System Improvements	9,668	13,868	23,603	20,505	1,396	1,488	1,213	Continuing	Continuing
4521 DIRECT	13,639	18,531	3,379	1,205	271	268	0	0	37,793
4610 MEECN EHF	0	0	12,248	23,033	11,665	0	0	0	46,946
Quantity of RDT&E Articles	0	0	7* 2/0**	7* 4/0**	0/4**	0	0	0	0

- (U) NOTES:**
- Project 4521, DIRECT, was established to consolidate efforts related to DIRECT being or planned for accomplishment in PE 0603851F, ICBM Modernization Dem/Val (BPAC 1024, ICBM C2 Applications), PE 0604851F, ICBM Modernization EMD (BPAC 13C4, Strategic C4 Program), PE 0101213F, Minuteman Squadrons, and PE 0303131F, MEECN (BPAC 2832, VLF/LF Systems Improvements).
 - *MMRT units **ILES units/trainers

(U) A. Mission Description and Budget Item Justification

(U) MEECN systems provide assured communications connectivity between the National Command Authorities (NCA) and the strategic deterrent forces. Past MEECN projects included the High Power Transmit Set (HPTS), Ground Wave Emergency Network (GWEN), and Dual Frequency MEECN Receiver (DFMR). Current projects include the Modified Miniature Receive Terminal (MMRT) with High Data Rate (HIDAR) mode, the Defense Improved Emergency Message Automated Transmission System (IEMATS) Replacement Command and Control Terminals (DIRECT), and the ICBM LCC Extremely High Frequency (EHF) System (ILES) component of MEECN EHF.

(U) This program is in Budget Activity 7 - Operational System Development, Research Category 6.6, because it supports work on currently operating systems.

(U) Acquisition Strategy:

(U) Modified Miniature Receive Terminal (MMRT) Program. Program to satisfy both the Air Force and Navy requirements via a joint effort with the Air Force Electronics Systems Center, Hanscom AFB, MA as the lead agency. Modifies existing Miniature Receive Terminals (MRTs). EMD contract awarded in FY96 for three platforms: the E-4B (National Airborne Operations Center (NAOC)); E-6B (Take Charge and Move Out (TACAMO)); and an option for the ICBM Launch Control Centers (LCCs). Limited ICBM LCC EMD option was exercised in 2QtrFY97 with balance of EMD to be restarted in FY99. Production contract award planned for FY00/01. Complete deployment of Air Force and Navy MMRT units by 2004.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998																																																																												
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)																																																																															
<p>(U) DIRECT Program. A contract for EMD was awarded on 12 Jul 96. Anticipate issuing a sole source contract for production in 2QtrFY98 for eight units.</p> <p>(U) ILES Program. A competitive cost plus award fee contract for EMD with firm fixed price options for production is expected. Anticipate EMD contract award in 1Qtr FY99.</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:40%;"></th> <th style="text-align: right;"><u>FY 1997</u></th> <th style="text-align: right;"><u>FY 1998</u></th> <th style="text-align: right;"><u>FY 1999</u></th> <th style="text-align: right;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">20,842</td> <td style="text-align: right;">34,409</td> <td style="text-align: right;">29,019</td> <td style="text-align: right;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">21,902</td> <td style="text-align: right;">34,409</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Reductions</td> <td style="text-align: right;">-525</td> <td style="text-align: right;">-1,236</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-535</td> <td style="text-align: right;">-774</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td style="text-align: right;">2,500</td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Recissions</td> <td style="text-align: right;">-35</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">10,211</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">23,307</td> <td style="text-align: right;">32,399</td> <td style="text-align: right;">39,230</td> <td style="text-align: right;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: \$224K in FY98 is pending reprogramming to fund other priorities. FY99-03 funding adjusted to provide for acceleration of the ICBM LCC MMRT effort and to provide for MMRT airborne testing. For more details, see individual projects.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:35%;"></th> <th style="text-align: right;"><u>FY 1997</u></th> <th style="text-align: right;"><u>FY 1998</u></th> <th style="text-align: right;"><u>FY 1999</u></th> <th style="text-align: right;"><u>FY 2000</u></th> <th style="text-align: right;"><u>FY 2001</u></th> <th style="text-align: right;"><u>FY 2002</u></th> <th style="text-align: right;"><u>FY 2003</u></th> <th style="text-align: right;"><u>To Compl</u></th> <th style="text-align: right;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) APPN 16, Other Procurement - AF, BA-63, P-052, Electronics and Telecommunications Equip (MEECN, PE 0303131F)</td> <td></td> <td style="text-align: right;">11,683</td> <td style="text-align: right;">1,545</td> <td style="text-align: right;">1,094</td> <td style="text-align: right;">35,226</td> <td style="text-align: right;">22,046</td> <td style="text-align: right;">10,482</td> <td style="text-align: right;">0</td> <td style="text-align: right;">82,108</td> </tr> </tbody> </table> <p> <u>Related PEs:</u> PE 0603851F, ICBM Dem/Val, PE 0604851F, ICBM EMD (both in FY97 only), PE 0302015F, E-4, BA-05, P-057, and PE 0101213F, Minuteman Squadrons (MMIII Modifications), BA-07, P-013</p> <p>(U) D. <u>Schedule Profile:</u> See individual projects.</p>										<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	20,842	34,409	29,019	Continuing	(U) Appropriated Value	21,902	34,409			(U) Adjustments to Appropriated Value					a. Cong Reductions	-525	-1,236			b. SBIR	-535	-774			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	2,500				e. Recissions	-35				(U) Adjustments to Budget Years Since FY 1998 PB			10,211		(U) Current Budget Submit/FY 1999 President's Budget	23,307	32,399	39,230	Continuing		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>	(U) APPN 16, Other Procurement - AF, BA-63, P-052, Electronics and Telecommunications Equip (MEECN, PE 0303131F)		11,683	1,545	1,094	35,226	22,046	10,482	0	82,108
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<i>Page 2 of 16 Pages</i>							Exhibit R-2 (PE 0303131F)																																																																												

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)				PROJECT 2832	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2832 VLF/LF System Improvements	9,668	13,868	23,603	20,505	1,396	1,488	1,213	Continuing	Continuing
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) The Modified Miniature Receive Terminal (MMRT) Program will modify existing Miniature Receive Terminals (MRTs) and provide High Data Rate (HIDAR) capability for installation in three platforms: the E-4B, National Airborne Operations Center (NAOC); the E-6B, Take Charge and Move Out (TACAMO); and ICBM Launch Control Centers (LCCs). This program will make VLF/LF receivers fully interoperable in all three platforms. MRT is a Very Low Frequency/Low Frequency (VLF/LF) receiver already designed, developed, and installed in the B-1 and B-52 bombers.</p> <p>(U) HIDAR is a Joint Staff-directed effort to provide a fast and interoperable MEECN mode. This program will develop and test modifications required to retrofit current MEECN platforms with the HIDAR software and firmware.</p> <p>(U) High Power Transmit Set (HPTS) was a joint Air Force and Navy Program to provide the E-4 and the E-6 aircraft with an improved and supportable VLF transmission capability. HPTS completed development phase in 2Qtr FY95. Procurement for the E-4 is under Departmental review.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$8,783 Continued common MMRT and airborne integration development - (U) \$285 Continuing Evaluation Program (CEP) - (U) \$600 Set aside for BTR to 0305165F - (U) \$9,668 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$12,500 Continue common MMRT and airborne integration development - (U) \$204 Secondary VLF/LF Link study/analysis - (U) \$1,068 Continuing Evaluation Program (CEP) - (U) \$96 Pending reprogramming to fund higher priorities 									
Project 2832			Page 3 of 16 Pages			Exhibit R-2 (PE 0303131F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)	PROJECT 2832																																																							
<p>– (U) \$13,868 Total</p> <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <p>– (U) \$9,936 Continue common MMRT and airborne integration development</p> <p>– (U) \$2,400 MMRT Testing</p> <p>– (U) \$9,900 Re-start MMRT ICBM LCCs integration development</p> <p>– (U) \$1,367 Continuing Evaluation Program (CEP)</p> <p>– (U) \$23,603 Total</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">9,668</td> <td style="text-align: right;">14,686</td> <td style="text-align: right;">11,778</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">10,489</td> <td style="text-align: right;">14,686</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Reductions</td> <td style="text-align: right;">-286</td> <td style="text-align: right;">-487</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-535</td> <td style="text-align: right;">-331</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Recissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">11,825</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">9,668</td> <td style="text-align: right;">13,868</td> <td style="text-align: right;">23,603</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: \$96K in FY98 is pending reprogramming to fund other priorities. FY99-03 funding adjusted to provide for acceleration of the ICBM LCC effort and to provide for MMRT airborne testing.</p> <p style="padding-left: 20px;">Schedule: Air worthiness certification delayed by six months. ICBM LCCs integration has been accelerated by one year.</p> <p style="padding-left: 20px;">Technical: None.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	9,668	14,686	11,778	Continuing	(U) Appropriated Value	10,489	14,686			(U) Adjustments to Appropriated Value					a. Cong Reductions	-286	-487			b. SBIR	-535	-331			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Recissions					(U) Adjustments to Budget Years Since FY 1998 PB			11,825		(U) Current Budget Submit/FY 1999 President's Budget	9,668	13,868	23,603	Continuing
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Project 2832	Page 4 of 16 Pages	Exhibit R-2 (PE 0303131F)																																																							

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)	PROJECT 2832

(U) C. Other Program Funding Summary (\$ in Thousands):

Related PEs: PE 0603851F, ICBM Dem/Val, (FY97 only), PE 0302015F, E-4, BA-05, P-057, and PE 0101213F, Minuteman Squadrons (MMIII Modifications), BA-07, P-013.

(U) D. Schedule Profile

		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4	
(U) MMRT EMD													
(U) EMD for Aircraft	FY96											FY00	
(U) EMD for ICBM LCCs (Phase 1)		X*						X					
(U) EMD for ICBM LCCs (Phase 2)									X*			FY01	
(U) CDR					X								
(U) A/C IOT&E												X*	
*Start/Complete													

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)				PROJECT 2832			
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>											
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>					
(U)	Primary Hardware Development			7,141	5,712	11,990					
(U)	Software Development			311	1,019	2,351					
(U)	Systems Engineering			425	624	1718					
(U)	Development Test and Evaluation				1,100	2,996					
(U)	Contractor Engineering Support			379	451	673					
(U)	Government Engineering Support			425	2,962	1,244					
(U)	Travel			102	380	577					
(U)	Miscellaneous				456	687					
(U)	CEP			285	1,068	1,367					
(U)	Pending reprogramming to fund higher priorities			600	96	0					
(U)	Total			9,668	13,868	23,603					
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
	Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>											
	Rockwell	CPAF	Aug 92	13,500	13,500	13,500	0	0	0	0	13,500
	Rockwell	CPAF	Jul 96	n/a	n/a	40,149	8,256	8,806	16,732	Continuing	77,597
Project 2832				Page 6 of 16 Pages				Exhibit R-3 (PE 0303131F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)				PROJECT 2832	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
TEMS	LOE	Annual			910	527	1,798	1,508	Continuing	Continuing
SPAWAR	MIPR	Annual				285	1,068	1,367	Continuing	Continuing
SysCen										
NavAir Warfare Center IPT	MIPR	Annual					1,000	1,000	Continuing	Continuing
Reprogramming					0	600	96			
<u>Test and Evaluation Organizations</u>										
NavAir Warfare Center	MIPR	Annual			390	0	1,100	2,996	Continuing	Continuing
Government Furnished Property: None.										
					Total Prior to FY 1997	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
Subtotal Product Development					53,649	8,256	8,806	16,732	Continuing	Continuing
Subtotal Support and Management					910	1,412	3,962	3,875	Continuing	Continuing
Subtotal Test and Evaluation					390	0	1,100	2,996	Continuing	Continuing
Total Project					54,949	9,668	13,868	23,603	Continuing	Continuing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)	PROJECT 4521
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4521 DIRECT	13,639	18,531	3,379	1,205	271	268	0	0	37,793

NOTE: This project was established in Jan 96 to consolidate efforts related to DIRECT currently being or planned for accomplishment in PE 0603851F, ICBM Modernization Dem/Val (BPAC 1024, ICBM C2 Applications), PE 0604851F, ICBM Modernization EMD (BPAC 13C4, Strategic C4 Program), PE 0101213F, Minuteman Squadrons, and 0303131F, MEECN (BPAC 2832, VLF/LF System Improvements).

(U) A. Mission Description and Budget Item Justification

(U) The Defense IEMATS Replacement Command and Control Terminals (DIRECT), which is the Improved Emergency Message Automated Transmission System (IEMATS) replacement program, is a Strategic Nuclear Command and Control (C2) system directly supporting the Chairman of the Joint Chiefs of Staff (CJCS) and the National Command Authorities (NCA). DIRECT will provide for all current IEMATS requirements, including the build, release, and transmission of Emergency Action Messages (EAM) to allow the CJCS and warfighters to remain responsive to NCA directives. This program will procure system hardware for seven unified command centers and a software maintenance facility. DIRECT will be compatible with the Defense Message System (DMS) when it supplants the Automated Digital Network (AUTODIN) and will interface with all other EAM distribution communications systems. The Director, Joint Staff, established an urgent and compelling need to field an IEMATS replacement system no later than second quarter FY99 to insure the orderly closure of AUTODIN Switching Centers (ASC).

(U) FY 1997 (\$ in Thousands):

- (U) \$11,109 DIRECT Engineering and Manufacturing Development
- (U) \$2,000 Automated Codebook Module (ACM)
- (U) \$130 Continuing Evaluation Program (CEP)
- (U) \$400 Set aside for BTR to 0305165F
- (U) \$13,639 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$18,110 Continue DIRECT Engineering and Manufacturing Development
- (U) \$0 Continue Automated Codebook Module (ACM)
- (U) \$293 Continuing Evaluation Program (CEP)
- (U) \$128 Pending reprogramming to fund higher priorities
- (U) \$18,531 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)	PROJECT 4521																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$3,110 Continue DIRECT Engineering and Manufacturing Development - (U) \$0 Continue Automated Codebook Module (ACM) - (U) \$269 Continuing Evaluation Program (CEP) - (U) \$3,379 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">11,174</td> <td style="text-align: right;">19,723</td> <td style="text-align: right;">4,747</td> <td style="text-align: right;">37,235</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">11,413</td> <td style="text-align: right;">19,723</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td style="text-align: right;">-239</td> <td style="text-align: right;">-749</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td style="text-align: right;">-443</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: right;">2,500</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Recissions</td> <td style="text-align: right;">-35</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-1,368</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">13,639</td> <td style="text-align: right;">18,531</td> <td style="text-align: right;">3,379</td> <td style="text-align: right;">37,793</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: \$128K in FY98 is pending reprogramming to fund higher priorities. FY99 funding reduced to fund other AF and DoD priorities. Automated Codebook Module (ACM) deferred.</p> <p style="padding-left: 20px;">Schedule: Initial Operational Capability (IOC) not later than (NLT) 2QtrFY99 necessary to eliminate dependence on AUTODIN Switching Centers (ASCs) scheduled for CY99 closure. FY98 Congressional add enables initial DIRECT fielding to occur in FY99.</p> <p style="padding-left: 20px;">Technical: None.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	11,174	19,723	4,747	37,235	(U) Appropriated Value	11,413	19,723			(U) Adjustments to Appropriated Value					a. Cong Reductions	-239	-749			b. SBIR		-443			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming	2,500				e. Recissions	-35				(U) Adjustments to Budget Years Since FY 1998 PB			-1,368		(U) Current Budget Submit/FY 1999 President's Budget	13,639	18,531	3,379	37,793
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Project 4521	Page 9 of 16 Pages	Exhibit R-2 (PE 0303131F)																																																							

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)	PROJECT 4521

(U) C. Other Program Funding Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) APPN 16, Other Procurement - AF, BA-63, P-052, Electronics and Telecommunications Equip (MEECN, PE 0303131F)		11,715	1,545	1,094				0	14,705

Related PEs: PE 0603851F, ICBM Dem/Val (FY97 only).

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Development Test and Evaluation			X*			X						
(U) CDR						X*						
(U) Operational Test and Evaluation							X*		X			
(U) Procurement						X*				X		
(U) Required DIRECT IOC										X		

*Start/Complete

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)				PROJECT 4521		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U)	Primary Hardware Development			2,730	3,699	588				
(U)	Software Development			4,003	7,554	1,312				
(U)	Systems Engineering			1,254	2,391	416				
(U)	Technical Data			84	161	28				
(U)	Automated Codebook Module			2,000	0	0				
(U)	Development Test and Engineering			120	230	40				
(U)	Government Engineering Support			2,001	2,379	430				
(U)	Program Management Support			808	1,541	268				
(U)	Travel			109	155	28				
(U)	CEP			130	293	269				
(U)	Pending reprogramming to fund higher priorities			400	128	0				
(U)	Total			13,639	18,531	3,379				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997*	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
GTE	CPAF	Jul 96	23,879	23,879	0	8,601	13,805	2,344	1,114	25,864
National Security Agency (NSA)	MIPR	Annually	5,000	5,000	500	2,000	0	0	0	2,500
Project 4521				Page 11 of 16 Pages				Exhibit R-3 (PE 0303131F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)					PROJECT 4521
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997*	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
MITRE	LOE	Annual	n/a	8,315	0	2,201	3,379	430	630	6,640
JHU-APL	LOE	Annual	n/a			130	293	269		692
Program Office	Various	Annual	n/a			187	696	296		1,179
Reprogramming						400	128			528
<u>Test and Evaluation Organizations</u>										
Various	Various		n/a	406	0	120	230	40	0	390
Government Furnished Property: None										
					Total Prior to FY 1997*	Budget FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
Subtotal Product Development					500	10,601	13,805	2,344	1,114	28,364
Subtotal Support and Management						2,918	4,496	995	630	9,039
Subtotal Test and Evaluation						120	230	40		390
Total Project					500	13,639	18,531	3,379	1,744	37,793
* Excludes prior year funding in VLF/LF System Improvements (BPAC 2832, this PE)										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303131F Minimum Essential Emergency				PROJECT 4610		
				Communications Network (MEECN)						
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
4610 MEECN EHF	0	0	12,248	23,033	11,665	0	0	0	46,946	
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) This MEECN project will provide reliable, secure, and survivable communications in the Extremely High Frequency (EHF) band. Specifically, this effort is currently focused on replacing the satellite-based, ground communication links with Minuteman ICBM forces. It supplants the ICBM Super High Frequency (SHF) Satellite Terminal (ISST) receipt, providing force direction/execution, and the Ultra High Frequency (UHF) report-back links. ISST relies upon the Single Channel Transponder (SCT) package aboard the Defense Satellite Communications System (DSCS). The SCT will not be flown on the DSCS after 2003. Extending the use of SCT aboard DSCS is not practical. The UHF links depend upon the Air Force Satellite Communications (AFSATCOM) packages hosted aboard the Fleet Satellite Communications (FLTSATCOM) satellites. FLTSATCOM satellites are past their life expectancy. This integrated EHF system will be called the ICBM Launch Control Center (LCC) Extremely High Frequency (EHF) System (ILES). ILES is required to meet redundancy standards established by national security directives.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$0 Total - Program starts in FY99 <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$0 Total - Program starts in FY99 <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$10,196 Engineering and manufacturing development - (U) \$252 Development Test and Evaluation - (U) \$1,800 Program Management Support - (U) \$12,248 Total 										
Project 4610			<i>Page 13 of 16 Pages</i>			Exhibit R-2 (PE 0303131F)				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)			PROJECT 4610		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>					
				<u>Cost</u>					
(U) Previous President's Budget (FY 1998 PB)	0	0	12,494	48,089					
(U) Appropriated Value	0	0							
(U) Adjustments to Appropriated Value									
a. Cong Reductions									
b. SBIR									
c. Omnibus or Other Above Threshold Reprogram									
d. Below Threshold Reprogramming									
(U) Adjustments to Budget Years Since FY 1998 PB			-246						
(U) Current Budget Submit/FY 1999 President's Budget	0	0	12,248	46,946					
(U) Change Summary Explanation: This program initiated in response to DoD direction with RDT&E commencing in FY99. FY99 funding reduced to fund other AF and DoD priorities.									
(U) C. <u>Other Program Funding Summary (\$ in Thousands):</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
								<u>Compl</u>	<u>Cost</u>
(U) APPN 16, Other Procurement - AF, BA-63, P-052, Electronics and Telecommunications Equip (MEECN, PE 0303131F)	0	0	0	0	35,226	22,046	10,482	0	70,487
<u>Related PEs:</u> None.									
(U) D. <u>Schedule Profile</u>									
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>			
		2	3	2	3	2	3		
(U) Contract Award	1		4	1		4	1	2	3
						X			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development			PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)				PROJECT 4610			
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
			<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>			
(U)	Primary hardware development						5,630			
(U)	Software development						1,315			
(U)	Systems engineering						1,800			
(U)	Development Test and Evaluation						252			
(U)	Contractor engineering support						275			
(U)	Program management support						1,800			
(U)	Government engineering support						580			
(U)	Misc/Travel						596			
(U)	Total		0		0		12,248			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
TBD	TBD	2QtrFY99			0	0	0	8,745	26,916	35,661
<u>Support and Management Organizations</u>										
TBD	TBD	TBD			0	0	0	3,251	10,006	13,257
<u>Test and Evaluation Organizations</u>										
TBD	TBD	TBD			0	0	0	252	776	1,028
Project 4610			Page 15 of 16 Pages				Exhibit R-3 (PE 0303131F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303131F Minimum Essential Emergency Communications Network (MEECN)			PROJECT 4610		
Government Furnished Property: None									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>									
TBD									
<u>Support and Management Organizations</u>									
TBD									
<u>Test and Evaluation Organizations</u>									
TBD									
				<u>Total Prior to FY 1997*</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development							8,745	26,916	35,661
Subtotal Support and Management							3,251	10,006	13,257
Subtotal Test and Evaluation							252	776	1,028
Total Project							12,248	37,698	49,946

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	6,667	4,961	8,420	8,137	7,422	7,154	7,243	Continuing	TBD
7820 Computer Security RDT&E: Firestarter	6,667	3,321	4,460	4,923	5,477	5,218	5,316	Continuing	TBD
4585 Cryptologic 2000	0	1,640	1,999	1,262	0	0	0	0	4,901
4579 Information Warfare	0	0	1,961	1,952	1,945	1,936	1,927	Continuing	TBD
Quantity of RDT&E Articles	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(U) A. Mission Description and Budget Item Justification

This program provides the capability to protect and defend USAF Command, Control, Communications, Computers, and Intelligence, Surveillance, and Reconnaissance (C4ISR) and Weapon Systems from IW attacks and recover from those attacks. Primarily, the project does research and development of information protection tools and transitions them to operational systems. It also provides the acquisition community and operational warfighters the ability to manage their own risks relative to mission, task, threat, and vulnerability information and to mitigate IW risks based on rank-ordered countermeasure recommendations. The program element consists of three complimentary projects.

The computer security project directs the R&D of Information Protection technology and tools to defend AF C4ISR systems, with emphasis on computer and network systems security, damage assessment and recovery, and multi-level systems security. This project focuses on protection and defense of the Air Force, Joint, National, and Defense Information Infrastructures. This R&D provides adequate access control, integrity, assured services and meets warfighter's requirements. The Cryptologic 2020 project comprises R&D for the Air Force Electronic Key Management System (AFEKMS). The AFEKMS, in concert with NSA's EKMS, provides a secure and flexible capability for the electronic generation, distribution, and management of key material, voice callwords, and Communications Security (COMSEC) publications for the F-22. AFEKMS replaces the existing physical distribution and management system providing COMSEC KEYS for USAF Information Protection. The Air Force unique AFEKMS software is required because the production software developed by NSA cannot provide the capabilities to distribute the system keys in the format needed by the F-22 Mission Support System. The Information Warfare project comprises R&D for Vulnerability Assessment/Risk Management (IW VA/RM) and Technology planning to build info protect into all AF C2, ISR, and weapons systems. This program is in budget activity 7, Operational System Development, because it addresses the development and transition of information security, protection and defensive capabilities and technologies to protect, detect, respond to, and defend against information attack by new and emerging IW threats.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development		PE NUMBER AND TITLE 0303140F Information Systems Security Program		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	6,548	5,298	6,589	TBD
(U) Appropriated Value	6,900	5,298		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-182	-215		
b. SBIR	-170	-122		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	+130			
e. Rescissions	-11			
(U) Adjustments to Budget Years Since FY 1998 PB			1,831	
(U) Current Budget Submit/FY 1999 President's Budget	6,667	4,961	8,420	TBD
 (U) Change Summary Explanation:				
Funding: FY99 funds added during 99 APOM for Information Warfare Vulnerability Assessment/Risk Management (VA/RM) Project.				
FY97 reprogramming of \$130,000 to initiate early VA/RM prototyping efforts.				
 Schedule: N/A				
 Technical: IW/VA/RM Project to build info protect into all C2, ISR, communications, and weapons systems.				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) For research and development efforts pursued under Program Element (PE) 33140F there is complementary work being performed under PE 35167G which addresses the development of generic technology in the area of information security. Products from PE 33140F transition to other agencies through PE 64740F Computer Resources Management Technology Transition.				
 (U) D. <u>Schedule Profile</u> See individual project schedules.				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program	PROJECT 7820
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
7820 Computer Security RDT&E: Firestarter	6,667	3,321	4,460	4,923	5,477	5,218	5,316	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

This program directs the Research & Development (R&D) of Information Protect technology/tools to provide the capability to defend USAF Command, Control, Communications, Computer, and Intelligence (C4I) Systems from Information Warfare (IW) Cyber attacks and to recover from those attacks. As the USAF single manager for Information Protect (R&D), this program directs C4I system Information Protect R&D with emphasis in computer/network systems security, damage assessment and recovery, and mullet-level security. With the advent of the information age, the battlefield commander's ability to fight and win becomes more dependent upon the availability, timeliness, and integrity of the information flow/processing capability available. The requirement for global presence and global power has demanded increasing reliance on these advanced information systems with global accessibility. The susceptibilities inherent in such reliance and accessibility has heightened the awareness that the National Information Infrastructure (NII) and the Defense Information Infrastructure (DII) must be protected against attack.

Emphasis is therefore placed on R&D areas that provide deterrence of attack through cyberspace surveillance, Tactical Indications & Warning (I&W), intrusion detection and characterization of attack. As adversaries may gain access to critical AF Force information system through a variety of means, including the Internet, other dial-connections, and DSNET, this technology will provide the capability of collecting, integrating, and displaying threat, vulnerability, and system data indicating an attack is about to take place and/or is taking place. Specifically this R&D supports Air Force requirements for Global Engagement by providing the technology that will protect the critical information infrastructure and systems necessary for the Air Force to carry out mission requirements. Current Air Force systems such as the Combat Information Transport Systems (CITS), Theater Deployable Communications (TDC) and Theater Battle Management - Core Systems (TBMCS) leverage the technology from this project to meet their Info Protect needs/requirements. Additionally, this project utilizes Info Assurance technology investments by DARPA as a jump-start for providing solution to Air Force requirements and cooperates with DISA and other services/agencies to ensure DII info protect requirements are complied with.

Also, R&D is required in automated damage assessment and recovery processes because Air Force does not currently have the automated assessment, planning and decision tools to support prudent Information Operations damage recovery. Summarizing, this program is in budget activity 7-Operational System Development, Research category 6.7 because it addresses the development and transition of communications and computer network Information Protection technologies/tools in order to protect, detect, defend and respond to information attack against Air Force Network Control Centers (AFNCCs), Theater Deployable Communications (TDC) systems and the National/Defense Information Infrastructure.

(U) Acquisition Strategy:

All major contracts within this Program Element are awarded after full and open competition.

DATE
February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0303140F Information Systems Security Program

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0303140F Information Systems Security Program	7820
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$230 Initiate development of secure data handling system for F-22 Integrated Weapon Systems (IWS) Data Base - (U) \$545 Develop mechanisms to protect databases from IW attacks - (U) \$545 Continue development of security analysis tools for Base Information Protection - (U) \$710 Initiate development of secure interoperable distributed computing system - (U) \$1,100 Prototype adaptive voice/data networks - (U) \$250 Initiate effort to develop technology for secure distributed collaborative planning - (U) \$150 Initiate effort to transition DARPA intrusion detection technology the Air Force Information Warfare Center (AFIWC) - (U) \$400 Initiate effort to demonstrate INFOSEC for Air Force Mission Support System (AFMSS) - (U) \$2,607 Complete development of Electronic Key Management System (Tier 1) - (U) \$130 Initiate Vulnerability Assessment & Risk Management toolset prototyping - (U) \$6,667 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$430 Continue development of secure interoperable distributed computing systems - (U) \$430 Prototype security analysis tools for Base Information Protection (BIP) - (U) \$430 Continue effort to transition DARPA intrusion detection technology the Air Force Information Warfare Center (AFIWC) and BIP - (U) \$430 Continue effort to demonstrate INFOSEC for Air Force Network Control Centers (AFNCCs) - (U) \$430 Continue effort to develop technology for secure distributed collaborative planning - (U) \$550 Continue investigation of techniques for commercial software evaluation - (U) \$621 Develop prototype secure wrapper to protect systems from COTS software security risks - (U) \$3,321 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$256 Continue development of secure data handling system for F-22 Integrated Weapon Systems (IWS) Data Base - (U) \$710 Continue development of secure interoperable distributed computing systems - (U) \$750 Continue development of technology for self-healing network system - (U) \$744 Develop methodologies for commercial software evaluation - (U) \$510 Complete effort to transition DARPA intrusion detection technology the Air Force Information Warfare Center (AFIWC) and BIP - (U) \$490 Complete effort to demonstrate INFOSEC for Air Force Network Control Centers (AFNCCs) - (U) \$500 Initiate effort to transition secure wrapper technologies into Air Force systems. 		
Project 7820	Page 4 of 20 Pages	Exhibit R-2 (PE 0303140F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program	PROJECT 7820		
<ul style="list-style-type: none"> - (U) \$500 Initiate effort for automatic capability to trace source of intrusions - (U) \$4,460 Total 				
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	6,548	3,561	4,550	TBD
(U) Appropriated Value	6,900	3,561		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-182	-158		
b. SBIR	-170	-82		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	+130			
(U) Adjustments to Budget Years Since FY 1997 PB	-11		-90	
(U) Current Budget Submit/FY 1999 President's Budget	6,667	3,321	4,460	TBD
(U) Change Summary Explanation:				
Funding: FY97 reprogramming of \$130,000 to initiate early VA/RM tool set prototyping efforts				
Schedule: Initiating VA/RM toolset prototyping accelerates delivery to SPOs by 18 months.				
Technical: None.				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) Not applicable				

DATE
February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0303140F Information Systems Security Program

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BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303140F Information Systems Security Program						PROJECT 7820			
(U) D. <u>Schedule Profile</u>														
		<u>FY 1997</u>					<u>FY 1998</u>					<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4		
(U) Requirements Review Board			*				X				X			
(U) AFNCC INFOSEC Transition				*			X				X			
(U) Adaptive Voice/Data Network Demonstrations							X							
(U) Secure Wrapper Development							X							
(U) Self-Healing Network Demonstration											X			
(U) F-22 IWS DB									X			X		
(U) Secure Interoperable Distributed Computing System												X		
(U) Trusted Rubix		*												
(U) Theater Battle Management Secure Interfaces														
(U) Begin Development Methodology for Commercial Software Evaluation									X					
(U) DARPA Information Assurance Technology Transition											X			
(U) Initiate Secure Wrapper Technology Transition									X					
(U) Initiate Technology for Tracing Sources of Intrusions									X					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303140F Information Systems Security Program			PROJECT 7820		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Secure Data Handling System				630	0	256			
(U)	Database Protection Mechanisms				545	411				
(U)	Security Analysis Tools				545	430				
(U)	DARPA Technology Insertion/Transition				150	860	510			
(U)	Secure Distributed Collaborative Planning				960	860	710			
(U)	IP Integration Framework					760	490			
(U)	Adaptive Voice/Data Networks				1,100	0	750			
(U)	Electronic Key Management System				2,607					
(U)	Traceback/Forensics						500			
(U)	Wrappers to Secure COTS						500			
(U)	VA/RM toolset prototyping				130					
(U)	COTS S/W Evaluation						744			
(U)	Total				6,667	3,321	4,460			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Product Development Organizations</u>										
FFRDC (MITRE)	MIPR	On-Going			0	460	660	700		1,420
Multiple Contractors	CPFF	On-Going			0	6,107	2,286	2,835	Continuin g	TBD
Project 7820					Page 7 of 20 Pages			Exhibit R-3 (PE 0303140F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303140F Information Systems Security Program				PROJECT 7820	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Universities	CPFF	On-Going			0	100	375	925		1,400
<u>Support and Management Organizations</u>										
N/A										
<u>Test and Evaluation Organizations</u>										
N/A										
Government Furnished Property:										
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date		Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Property</u>										
N/A										
<u>Support and Management Property</u>										
N/A										
<u>Test and Evaluation Property</u>										
N/A										
Subtotal Product Development					0	3,321	4,460	Continuing	TBD	
Subtotal Support and Management					0	0	0	0		
Subtotal Test and Evaluation					0	0	0	0		
Total Project					0	3,321	4,460	Continuing	TBD	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program	PROJECT 4585
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4585 Cryptologic 2000	0	1,640	1,999	1,262	0	0	0	0	4,901

(U) A. Mission Description and Budget Item Justification

The Cryptologic project consists of the Air Force Electronic Key Management Systems (AFEKMS). AFEKMS, in concert with NSA's EKMS, provides a secure and flexible capability for the electronic generation, distribution, accounting, and management of key material, voice callwords, and Communications Security (COMSEC) publications for the F-22 and all AF weapon systems. AFEKMS replaces the existing physical distribution and management system providing COMSEC keying material for USAF Information Protection. Information Protection emphasizes access control, multi-level secure databases, trusted computing and information integrity. AFEKMS is a three tier system structure in a hierarchical arrangement. This tiered structure provides "wholesale" to "retail" to "consumer" capability to distribute, manage and account for COMSEC keying material. Tier 1 installations comprise the "wholesale" capability. Tier 2 installations comprise the distribution network and tier 3 comprises the "retail locations" where keying material leaves the AFEKMS and enters the End Item COMSEC Equipment (EICE) – the consumer.

Acquisition includes Commercial Off The Shelf (COTS) computers and software, contractor developed application software, Government Furnished Equipment (GFE) and software such as the NSA's Local COMSEC Management Software (LCMS). Also, USAF developed application software (UAS) is necessary for unique systems such as the F-22 and unique key fill requirements of EICE for other airborne platforms. The F-22 platform employs KOV-5 modules and uses three types of keys (system keys and codes, traffic keys, and Firefly session keys and parameters). Using a Data Transfer Device (DTD), these keys are laded directly into the KOV-5 and ground based KS-5 using a Firefly process. The F-22 employs a unique process for getting cryptographic keys into the KOV-5 onboard the F-22 platform. This project enhances NSA developed EKMS S/W to meet F-22 unique requirements. It also upgrades the DTD to correct speed, storage, and operability deficiencies.

(U) Acquisition Strategy:

All major contracts within this Program Element are awarded after full and open competition.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0303140F Information Systems Security Program	4585
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$0- (U) \$0 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$620 Continue LCMS application software development (F-22)- (U) \$703 Initiative DMD/DTD support software development- (U) \$317 Initiate DMD Phase 1 development- (U) \$1,640 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$250 Complete LCMS application software development (F-22)- (U) \$189 Continue DMD/DTD software support development and system integration- (U) \$1,560 Initiate DMD Phase 2 development- (U) \$1,999 Total		
Project 4585	Page 10 of 20 Pages	Exhibit R-2 (PE 0303140F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program	PROJECT 4585
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	0	1,737	2,039	5,069
(U) Appropriated Value	0	1,737		
(U) Adjustments to Appropriated Value				
a. Cong Reductions		-57		
b. SBIR		-40		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1997 PB			-40	
(U) Current Budget Submit/FY 1999 President's Budget		1,640	1,999	4,901

(U) Change Summary Explanation:

Funding: None

Schedule: None

Technical: None

(U) C. Other Program Funding Summary (\$ in Thousands)

N/A

DATE
February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0303140F Information Systems Security Program

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit) DATE **February 1998**

BUDGET ACTIVITY **7 - Operational System Development** PE NUMBER AND TITLE **0303140F Information Systems Security Program** PROJECT **4585**

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Complete F-22 UAS Development												X
(U) Initiate DMD Phase 1 Development					*							
(U) Initiate DMD Phase 2 Development									X			
(U) Initiate DMD/DTD Support Software Development					*							

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303140F Information Systems Security Program				PROJECT 4585	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Software Development				0	1,640	1,999			
(U)	Total				0	1,640	1,999			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performin g Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Product Development Organizations</u>										
Motorola Inc. Space & Systems Technology Group (F19628-97-C-0600)	SS/CPFF	APR 97			0	0	585	245	0	830
SAIC Software & Systems Integration Group (GS-35F-44616)	BPA	MAY 98			0	0	1,055	1,754	0	2,809
<u>Support and Management Organizations</u>										
N/A										
<u>Test and Evaluation Organizations</u>										
N/A										
Project 4585					Page 13 of 20 Pages			Exhibit R-3 (PE 0303140F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303140F Information Systems Security Program				PROJECT 4585	
(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)									
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
N/A									
<u>Support and Management Property</u>									
N/A									
<u>Test and Evaluation Property</u>									
N/A									
Subtotal Product Development				0	1,640	1,999	0	3,639	
Subtotal Support and Management				0	0	0	0	0	
Subtotal Test and Evaluation				0	0	0	0	0	
Total Project				0	1,640	1,999	0	3,639	
Project 4585				Page 14 of 20 Pages			Exhibit R-3 (PE 0303140F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program	PROJECT 4579
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4579 Information Warfare	0	0	1,961	1,952	1,945	1,936	1,927	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

Builds information protection into all AF C2, ISR, and weapons systems. The project provides the acquisition community and operational warfighters the ability to manage the IW risks to their missions and operational tasks based on system threat and vulnerability information. Provides decision makers with countermeasures recommendations, rank-ordered based on most operational utility and relative cost. Looking across all assessment conducted on AF systems, the project also provide the USAF a unique system-of-systems perspective for managing IW risks, policy, and solutions that cut across individual system boundaries. The project consists of two complementary R&D efforts

Information Warfare Vulnerability Assessment & Risk Management (IW VA/RM). The development and sustainment of an IW VA/RM process and toolset comprising procedures, analytical resources, supporting threat, countermeasure, and vulnerability databases, and instruction and training materials. These will enable program acquisition and operational unit customer to conduct their own IW risk assessments. Provides sustainment for tool set, databases, and procedures. Libraries and databases of vulnerabilities, countermeasures, tools, and techniques will be developed and continually updated to allow customers to assess current information and quickly update their assessments and risk posture as threat and vulnerability information changes. Project accumulates results of individual assessments to synthesize an integrate USAF system-of-systems risk posture, supporting JFACC theater-level IW defense.

IW Technical Planning Integrated Product Team (IW TPIPT). Supports modernization planning for Counterinformation (CI) Mission Area and technology planning processes. Continuously identifies and evaluates commercial and Government inventory of available products that can be used to meet Counterinformation mission deficiencies. Develops and coordinates technology development and acquisition plans for resolving mission area deficiencies. Provides Government laboratories and private industry guidance on new technologies needed for the next 10 to 25 years.

(U) Acquisition Strategy:

All major contracts within this Program Element are awarded after full and open competition.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY		PROJECT
7 - Operational System Development	0303140F Information Systems Security Program	February 1998 4579
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$0 - (U) \$0 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$0 - (U) \$0 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$709 Exportable VA/RM process and toolset development - (U) \$441 Establish infrastructure: Intelligence support, metrics measurement, etc. - (U) \$370 Develop libraries and databases, system-of-systems model - (U) \$291 IW TPIPT activities, analyses, database support - (U) \$150 Integrated cross program assessments and solution development - (U) \$1,961 Total 		
Project 4579	Page 16 of 20 Pages	Exhibit R-2 (PE 0303140F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program	PROJECT 4579
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	0	0	0	0
(U) Appropriated Value				
(U) Adjustments to Appropriated Value				
a. Cong Reductions				
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1997 PB			1,961	TBD
(U) Current Budget Submit/FY 1999 President's Budget	0	0	1,961	TBD

(U) Change Summary Explanation:

Funding: FY99 funds added during FY99 APOM for Information Warfare Vulnerability Assessment & Risk Management (VA/RM) project

Schedule: See initial schedule profile below

Technical: IW VA/RM project builds info protect into all AF C2, ISR and weapons systems.

(U) C. Other Program Funding Summary (\$ in Thousands)

N/A

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BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0303140F Information Systems Security Program

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303140F Information Systems Security Program	PROJECT 4579
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Begin VA/RM tool set development									X			
(U) Begin infrastructure, libraries, and databases development									X			
(U) Begin developing system of systems model												X
(U) Develop & sustain AFMC fix plan									X			
(U) Develop & sustain IW TPIPT technology database (quarterly reviews)									X	X	X	X
(U) Develop & sustain IW TPIPT technology development plan (annual)											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303140F Information Systems Security Program				PROJECT 4579	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Software development				0	0	715			
(U)	Systems engineering support				0	0	1,096			
(U)	Program management support				0	0	150			
(U)	Total				0	0	1,961			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Contract to be Awarded	CPFF	OCT 99			0	0	0	715	TBD	TBD
<u>Support and Management Organizations</u>										
FFRDC (MITRE)	MIPR				0	0	0	596	Continuing	TBD
TEMS (various)	CPFF				0	0	0	500	Continuing	TBD
<u>Test and Evaluation Organizations</u>										
Test & Evaluation					0	0	0	150	Continuing	TBD
Project 4579					Page 19 of 20 Pages			Exhibit R-3 (PE 0303140F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303140F Information Systems Security Program				PROJECT 4579	
(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)									
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
N/A									
<u>Support and Management Property</u>									
N/A									
<u>Test and Evaluation Property</u>									
N/A									
Subtotal Product Development				0	0	715	TBD	TBD	
Subtotal Support and Management				0	0	1,096	Continuing	TBD	
Subtotal Test and Evaluation				0	0	150	Continuing	TBD	
Total Project				0	0	1,961	Continuing	TBD	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303141F Global Combat Support System (GCSS)	PROJECT 4655
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4655 GCSS-AF (BLSM II)	14,943	19,745	17,973	19,742	21,317	19,993	22,381	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* The FY97 and outyear RDT&E funding for this project was transferred from PE 0308610F, Information Management Automation Program to PE 0303141F, Global Combat Support System - Air Force. This action was taken since the FY96 DoD Appropriations Act directed GCSS-AF to be RDT&E funded. The GCSS-AF program was broken out from PE 0308610F into this separate program element.

(U) A. Mission Description and Budget Item Justification
 The Base Level System Modernization I (BLSM I) was the pilot program for GCSS-AF. The BLSM I program modernized three key base level pilot systems; Manpower Data Systems (MDS), Logistics Module (LOGMOD), and Air Force Operations Resource Management System (AFORMS)); to provide essential support to the mission for the Air Force in the areas of manpower, logistics, and flight records. GCSS-AF (once called BLSM II) continues the BLSM I effort with the addition of the Cargo Movement Operations System (CMOS) and the Standard Base Supply System (SBSS). GCSS-AF is the modernization program that will modernize, integrate, evolve, and maintain standard Air Force and Department of Defense (DoD) Combat Support Automated Information Systems (AISs). The products of this development will be:

- (1) A Common Operating Environment (COE). Systems modernized under GCSS-AF will migrate to an open system environment to reduce maintenance cost and integrate the many stove-pipe systems into one integrated management information system of applications. Sustainment costs will be reduced with an increase in productivity through use of a Defense Information Infrastructure (DII) compliant Common Operating Environment (COE). Adaptable applications level software can then be added with minimum effort and expense.
- (2) A Combat Support Information System (CSIS) consisting of supply, maintenance, civil engineering, base accounting and finance functions, personnel and manpower management, and a variety of related services which will move the Air Force into the 21st Century with the technology for warfighters to be successful in all scenarios. The CSIS will improve operational readiness by enhancing the capabilities and timeliness of all Air Force standard functional Automated Information Systems (AIS) supporting critical warfighting weapon systems. CSIS will work within an enterprise-wide shared data environment. The shared data environment will become the source of functional support data for command and control decision support systems that support the wing commander, theater battlestaffs, as well as high headquarters. The system will cover both retail and wholesale functions.

This program is in Budget Activity 7, Operational System Development, because the program modernizes Automated Information Systems (AISs). This PE contains only the RDT&E portion of GCSS-AF. No specific procurement funding is identified after FY97. O&M funding will come from the legacy systems being modernized.

(U) Acquisition Strategy:
 All major contracts within this Program Element were awarded after full and open competition.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0303141F Global Combat Support System (GCSS)	4655
(U) FY 1997 (\$ in Thousands):		
- (U)	GCSS System Contract	
- (U) \$2,100	Common Operating Environment (COE) Increment 1	
- (U) \$12,263	Combat Support Information System (CSIS) Increment 1	
- (U)	Operations	
- (U) \$80	Support Contractors (MITRE, TEMS, Cost)	
- (U) \$500	BLSM I	
- (U) \$14,943	Total	
(U) FY 1998 (\$ in Thousands):		
- (U)	GCSS System Contract	
- (U) \$1,625	Common Operating Environment (COE) Increment 1	
- (U) \$12,489	Combat Support Information System (CSIS) Increment 1	
- (U)	Operations	
- (U) \$760	Support Contractors (MITRE, TEMS, Cost)	
- (U) \$4,871	SPO Operations	
- (U) \$19,745	Total	
(U) FY 1999 (\$ in Thousands):		
- (U)	GCSS System Contract	
- (U) \$1,669	Common Operating Environment (COE) Increment 1	
- (U) \$10,971	Combat Support Information System (CSIS) Increment 1	
- (U)	Operations	
- (U) \$780	Support Contractors (MITRE, TEMS, Cost)	
- (U) \$3,489	SPO Operations	
- (U) \$1,064	Defense Information Infrastructure-Air Force (DII-AF) System Program Office (SPO) Operations	
- (U) \$17,973	Total	
Project 4655	Page 2 of 7 Pages	Exhibit R-2 (PE 0303141F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303141F Global Combat Support System (GCSS)			PROJECT 4655																																																							
<p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 97</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998 PB)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">20,894</td> <td style="text-align: center;">18,334</td> <td style="text-align: center;">Cont.</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">0</td> <td style="text-align: center;">20,894</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional/General Reductions</td> <td></td> <td style="text-align: center;">-695</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td style="text-align: center;">-454</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogramming</td> <td style="text-align: center;">14,543</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: center;">400</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-361</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">14,943</td> <td style="text-align: center;">19,745</td> <td style="text-align: center;">17,973</td> <td style="text-align: center;">Cont.</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">(U) Funding: The FY97 and outyear RDT&E funding for this project was transferred from PE 0308610F, Information Management Automation Program to PE 0303141F, Global Combat Support System - Air Force. This action was taken since the FY96 DoD Appropriations Act directed GCSS-AF be RDT&E funded and because of the high interest in this program, the GCSS-AF program was broken out from PE 0308610F into this separate program element.</p> <p style="padding-left: 40px;">(U) Schedule: Impact of funding cuts to the GCSS-AF schedule are still being assessed at this time.</p> <p style="padding-left: 40px;">(U) Technical: None.</p>		<u>FY 97</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY1998 PB)	0	20,894	18,334	Cont.	(U) Appropriated Value	0	20,894			(U) Adjustments to Appropriated Value					a. Congressional/General Reductions		-695			b. SBIR		-454			c. Omnibus or Other Above Threshold Reprogramming	14,543				d. Below Threshold Reprogramming	400				e. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB			-361		(U) Current Budget Submit/FY 1999 President's Budget	14,943	19,745	17,973	Cont.				
	<u>FY 97</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>																																																							
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Project 4655	Page 3 of 7 Pages		Exhibit R-2 (PE 0303141F)																																																								

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303141F Global Combat Support System (GCSS)	PROJECT 4655
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 97</u>	<u>FY 98</u>	<u>FY 99</u>	<u>FY 00</u>	<u>FY 01</u>	<u>FY 02</u>	<u>FY 03</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Proc AF, BA 7, P-1:55, (Phase 1)*	996								12,512
(U) Other Proc AF, BA 7, P-1:55, (Phase 2)**	7,200								7,200
(U) O&M, AF***	7,900								7,900
(U) O&M (LOGMOD)****		4,989	3,630	3,781	3,937	4,074	4,221	TBD	TBD
(U) O&M (AFORMS)****		3,675	2,111	2,173	2,246	2,330	2,423	TBD	TBD
(U) O&M (SBSS)****		13,816	15,634	18,304	17,821	18,775	19,660	TBD	TBD
(U) O&M (MDS)****		2,702	2,351	2,397	2,448	2,501	2,558	TBD	TBD
(U) O&M (CMOS)****		3,591	4,001	3,721	3,814	3,962	4,102	TBD	TBD
(U) Other Proc AF, BA 7, P-1:55, (CMOS)		404	316	332	340	336	329	TBD	TBD

* Funding for fielding the Phase 1 prototype systems.

** Funding for enterprise license for Commercial Off-the-Shelf Software part of SBSS modernization solution

*** Support Phase I prototype systems and manpower/DBOF costs (in FY98+ these costs are in RDT&E lines shown above)

**** Legacy systems' O&M funds currently used for system support will be transitioned to support the new systems (COE and CSIS).

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Complete Phase 1			X									
(U) Phase 2 Increment 1.												
(U) Begin CSIS Increment 1	X											
(U) Complete CSIS Increment 1									X			
(U) Begin Rehost prototypes	X											
(U) Complete Rehost prototypes						X						
(U) Begin COE Increment 1	X											
(U) Complete COE Increment 1									X			
(U) Phase 2 Increment 2.												
(U) Begin CSIS Increment 2									X			
(U) Begin COE Refresh/Architecture									X			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303141F Global Combat Support System (GCSS)	PROJECT 4655
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(U) A. Project Cost Breakdown (\$000 in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) GCSS-AF System Contract			
(U) Common Operating Environment (COE) Inc 1	2,100	1,625	1,669
(U) Combat Support Information System (CSIS) Inc 1	12,263	12,489	10,971
(U) Operations			
(U) Support Contractor (MITRE, TEMS, Cost)	80	760	780
(U) SPO Operations	0	4,871	3,489
(U) DII-AF SPO Operations			1,064
(U) BLSM I	500		
(U) Total.	14,943	19,745	17,973

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303141F Global Combat Support System (GCSS)	PROJECT 4655
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Lockheed Martin	IDIQ	15 Aug 95	N/A	N/A	4,417	14,363	15,263	13,001	Con.	Cont
<u>Support and Management Organizations</u>										
MITRE		Var	N/A	N/A	73	35	395	380	Cont	Cont
TEMS		Var	N/A	N/A	1,449	45	365	400	Cont	Cont
ESC	N/A	N/A	N/A	N/A	3,851	500	3,722	4,192	Cont	Cont
<u>Test and Evaluation Organizations</u>										
Not applicable.										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303141F Global Combat Support System (GCSS)	PROJECT 4655
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Government Furnished Property: Not applicable.										
Subtotal Product Development					4,417	14,363	15,263	13,001	Cont	Cont
Subtotal Support and Management					5,373	580	4,482	4,972	Cont	Cont
Subtotal Test and Evaluation										
Total Project					9,790	14,943	19,745	17,973	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303144F Electromag Compatibility Analysis Ctr	PROJECT 649E
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
649E Electromagnetic Compatibility Analysis Center (ECAC)*	7,295	7,588	0	0	0	0	0	TBD	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

***The Joint Spectrum Center budget was moved to Defense Information Systems Agency beginning in FY99.**

(U) **A. Mission Description and Budget Item Justification** The Joint Spectrum Center, formerly called the Electromagnetic Compatibility Analysis Center (ECAC), serves as the DoD focal point for electromagnetic (EM) spectrum management matters in support of the Unified Commands, Military Departments, and Defense Agencies in planning, acquisition, training, and operations. The Joint Spectrum Center receives operational guidance from the Joint Staff (J6) and policy guidance from the Assistant Secretary of Defense for Command, Control, Communications and Intelligence (ASD(C3I)). Air Force, the designated Executive Agent for the Joint Spectrum Center, is responsible for programming, budgeting, and financing the Joint Program. Joint Spectrum Center realigned from Air Force to Defense Information Systems Agency, PE 0303153K beginning in FY1999. Effective 22 December 1997, Joint Spectrum Center reports operationally to Defense Information Systems Agency. The Joint Spectrum Center is the responsible activity for DoD spectrum management and use automation for strategic, theater, and tactical operations. The Joint Spectrum Center has the responsibility for architecture and standardization of DoD automated spectrum information and management systems. Specifically, the Center designs, develops, and maintains DoD automated spectrum management systems, evaluation tools, and databases employed by the Unified Commands, Military Departments, and Defense Agencies. The Joint Spectrum Center databases are the prime sources of information for DoD use of the EM spectrum. The Joint Spectrum Center provides guidance and assistance to Office of Assistant Secretary of Defense (OASD), Joint Staff, DoD activities and Unified Commands to ensure development and acquisition of electromagnetically compatible systems and for the effective deployment of these systems in military operations. This Center is the focal point for spectrum related support, Electromagnetic Environmental Effects (E3), and EM interference resolution assistance to operational units including deployable support to CINC Joint Task Forces. The Joint Spectrum Center mission is integral to other vital activities such as Information Warfare (IW), Command and Control (C2) Protect and other defensive C3 warfare activities as directed by the Joint Staff. This program is in budget activity 7 - Operational System Development, because it involves efforts supporting operational systems development.

(U) **Acquisition Strategy:** Engineering support services for the Joint Spectrum Center are provided by contract. No in-house government capability exists, nor is it practical to develop one, that can provide the expertise necessary to fulfill the mission and responsibilities of the Joint Spectrum Center. The basic period of the current cost plus award fee contract ends 30 September 1998. The contract has provision for option to renew for an additional two years (1 October 1998 through 30 September 1999 and 1 October 1999 - 30 September 2000). Full and open competition will be used for acquisition of follow-on contract(s). At the appropriate time, a request for sources will be synopsisized in the Commerce Business Daily (CBD) for the purpose of identifying potential sources for the Joint Spectrum Center support requirements.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0303144F Electromag Compatibility Analysis Ctr	February 1998 649E
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$1,975 Spectrum Policy and Spectrum Requirements Analysis support to Office of Assistant Secretary of Defense and Joint Staff- (U) \$1,300 Initiated DoD Standard Spectrum Management Information System (Spectrum XXI)- (U) \$2,943 Continued development of DoD electromagnetic compatibility databases and models and simulations- (U) \$1,077 Initiated DoD Joint Electromagnetic Effects (E3) Ordnance Program- (U) \$7,295 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$1,845 Spectrum Policy and Spectrum Requirements Analysis support to Office of Assistant Secretary of Defense and Joint Staff- (U) \$2,245 Continue development of DoD Standard Spectrum Management Information System (Spectrum XXI)- (U) \$2,303 Continue development of DoD electromagnetic compatibility (EMC) databases and models and simulations- (U) \$1,195 Continue DoD Joint Electromagnetic Effects (E3) Ordnance Program Development- (U) \$7,588 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) \$0 Total		
Project 649E	Page 2 of 7 Pages	Exhibit R-2 (PE 0303144F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303144F Electromag Compatibility Analysis Ctr	PROJECT 649E
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	7,307	7,844	7,973	TBD
(U) Appropriated Value	7,667	7,844		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-160	-256		
b. SBIR	-200			
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-12			
(U) Adjustments to Budget Years Since FY 1998 PB			-7,973	
(U) Current Budget Submit/FY99 President's Budget	7,295	7,588	0	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303144F Electromag Compatibility Analysis Ctr	PROJECT 649E
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(U) Change Summary Explanation:

Funding: FY99 adjustment due to realignment of Joint Spectrum Center to Defense Information Systems Agency PE 0303153K.

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl TBD</u>	<u>Total Cost TBDt</u>
(U) Operations & Maintenance AF BA 1	11,245	11,940							
(U) Operations & Maintenance DISA PE0303153K			14,130	14,268	13,748	13,900	14,254		
(U) Research & Development DISA PE 0303153K			8,839	8,967	9,039	9,581	9,892		

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Decision to Exercise Contract Option				X								
(U) Exercise Contract Option					X					X		
(U) Commerce Business Daily Notice for engineering support services for Joint Spectrum Center												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303144F Electromag Compatibility Analysis Ctr	PROJECT 649E
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Contractor Engineering Support	7,295	7,588	0
(U) Total	7,295	7,588	0

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303144F Electromag Compatibility Analysis Ctr	PROJECT 649E
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
None										
<u>Support and Management Organizations</u>										
None										
<u>Test and Evaluation Organizations</u>										
IIT Research Institute, Annapolis MD	C/CPAF/ Allot	17 May 95	17,487	17,487	3,004	7,045	7,438			17,487

Project 649E

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303144F Electromag Compatibility Analysis Ctr				PROJECT 649E	
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Test and Evaluation Property</u>									
GFP (hardware & software)	C/CPAF	17May95	1Jul95-30Sep98		250	150	0		TBD
Subtotal Product Development				0	0	0	0	0	0
Subtotal Support and Management				0	0	0	0	0	0
Subtotal Test and Evaluation				0	250	150	0		
Total Project				3,004	7,295	7,588	0		17,487

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303150F WWMCCS/Global Command and Control System	PROJECT 4667
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4667 Global Command and Control System - AF	*	*	13,675	13,176	15,709	16,522	14,665	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

*Note 1 : Beginning in FY 1999, all funding in Program Element (PE) 0303152F was moved to PE 0303150F and the program title changed from Automated Data Processing Equipment to Global Command and Control System (GCCS). This is an effort to consolidate/centralize accounting for the AF-GCCS program, which is now the operational system of record.

Note 2 : In future exhibits, Deliberate and Crisis Action Planning and Execution Segments (DCAPES) will be submitted as a separate project (4763). For administrative purposes, FY98 & FY99 DCAPES funds will be executed in project 4763.

(U) A. Mission Description and Budget Item Justification

(U) The Global Command and Control System (GCCS) is the designated Command and Control migration system for the DoD. It is an integrated Command, Control, Communications, Computer, and Intelligence (C4I) system capable of supporting all echelons of the US military command structure. GCCS solves C4I interoperability problems between Service components by establishing a Defense Information Infrastructure (DII) Common Operating Environment (COE), as the first step to eliminating stovepipe systems. The AF is responsible for developing four of the modules that will make up this COE, and integration of AF unique applications with the COE. This effort is Budget Activity 7, Operational System Development, because the program develops and implements software for an operational computer network.

(U) **Acquisition Strategy:** Electronics Systems Center (ESC), Hanscom AFB, MA will manage the overall GCCS-AF program (COE and Crisis Action Planning Evolution) development. The COE development is being performed in-house to support AF contributions to the joint service GCCS program and to support AF mission applications that utilize the COE. The Crisis Action Planning Evolution and associated prototype software development will be commercially developed under the current Command and Control Product Line (CCPL) contract at ESC to deliver a Deliberate and Crisis Action Planning and Execution Segments (DCAPES). During FY 98, a contractor will be selected from the pre-qualified CCPL contractors to develop the DCAPES.

(U) FY 1997 (Funding reported in PE 0303152)

- (U) 0 Total

(U) FY 1998 (Funding reported in PE 0303152)

- (U) 0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303150F WWMCCS/Global Command and Control System	PROJECT 4667																																																							
<p>(U) <u>FY 1999</u></p> <ul style="list-style-type: none"> - (U) 3,875 GCCS Migration Support /COE Development - (U) 7,180 Crisis Action Planning Evolution - (U) 2,620 Prototype software development - (U) 13,675 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;">Total <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td align="center">0</td> <td align="center">0</td> <td align="center">0</td> <td align="center">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional/General Reductions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Year since FY 1998 PB</td> <td></td> <td></td> <td align="right">+13,675</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td align="center">0</td> <td align="center">0</td> <td align="right">13,675</td> <td align="center">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: Funding represents the consolidation of PE0303152 to 0303150; FY 97/98 was reported in PE 0303152. In addition to the transfer of \$6,650 due to the PE consolidation in FY99, \$7,025 was added to the program for development of the Deliberate and Crisis Action Planing and Execution System (DCAPES).</p> <p style="padding-left: 20px;">Schedule: The DCAPES schedule is currently being defined.</p> <p style="padding-left: 20px;">Technical: GCCS is an evolutionary system. The DII COE requirements continually evolve to solve C4I interoperability problems and to support the efficient migration/integration of C4I applications at all levels of command.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	0	0	0	TBD	(U) Appropriated Value					(U) Adjustments to Appropriated Value					a. Congressional/General Reductions					b. SBIR					c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Year since FY 1998 PB			+13,675		(U) Current Budget Submit/FY 1999 President's Budget	0	0	13,675	TBD
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>																																																					
(U) Previous President's Budget (FY 1998 PB)	0	0	0	TBD																																																					
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Project 4667	Page 2 of 5 Pages	Exhibit R-2 (PE 0303150F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303150F WWMCCS/Global Command and Control System				PROJECT 4667				
(U) C. <u>Other Program Funding Summary in PE 33152F (\$ in Thousands)</u>												
		<u>FY1997</u>	<u>FY1998</u>	<u>FY1999</u>	<u>FY2000</u>	<u>FY2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To Complete	Total Cost		
BA-7, P-50												
(U) Other Procurement, Air Force		*	*	5,819	5,806	5,783	5,851	5,871	Continuing	TBD		
(U) Operations and Maintenance, Air Force		*	*	62,731	64,468	63,024	64,524	67,952	Continuing	TBD		
Reported as part of PE 0303152												
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2	3	4
1.) (U) Common Operating Environment (COE) Development*												
• Multi-Media									X		X	
• Distributed Computing Services									X		X	
• Office Automation									X		X	
• Management Services									X		X	
2.) (U) Crisis Action Planning Enhancement												
										X		
(U) * Note: The COE development is incremental with scheduled releases based on the Defense Information Systems Agency (DISA) DII COE schedule.												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303150F WWMCCS/Global Command and Control System			PROJECT 4667		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Common Operating Environment (COE) Development							3,875			
(U) Crisis Action Planning Evolution							7,180			
(U) Prototype software development							2,620			
(U) Total					0*	0*	13,675			
* In PE 0303152										
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Product Development Organizations</u>										
Contractor or Government	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	Budget FY 1999	Budget to Complete	Total Program
(U) Rome Lab	FFP/FCA	Jun 95	N/A	N/A	0	0	0	0	TBD	TBD
(U) Material Systems Group	various	various	N/A	N/A	0	0	0	0	TBD	TBD
(U) Electronic Systems Center	various	various	N/A	N/A	*	*	*	9,275	TBD	TBD
					0					
<u>Support and Management Organizations</u>										
(U) TEMS	OT&M	Jun 95	N/A	N/A	*	0	0	1,800	TBD	TBD
(U) MITRE	OT&M	Jun 95	N/A	N/A	*	0	0	2,600	TBD	TBD
<u>Test and Evaluation Organizations</u>										
(U) Not Applicable										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303150F WWMCCS/Global Command and Control System			PROJECT 4667		
Government Furnished Property: None									
<u>Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				*	*	*	13,675	TBD	TBD
Subtotal Support and Management				*	0	0	0	TBD	TBD
Subtotal Test & Evaluation				0	0	0	0	0	0
Total				*	0	0	13,675	TBD	TBD
* Reported in PE 0303152									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303152F Automated Data Processing Equipment	PROJECT 4485
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4485 AF-GCCS	7,277	6,741	*	*	*	*	*	*	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

*Note: Beginning in FY 1999, all funding in Program Element (PE) 0303152F was transferred to PE 0303150F and the program title changed from Automated Data Processing Equipment to Global Command and Control System (GCCS). This is an effort to consolidate/centralize accounting for the AF-GCCS program, which is now the operational system of record. Total cost for this PE has been transferred to PE 0303150F and will be included in that amount.

(U) A. Mission Description and Budget Item Justification

(U) The Global Command and Control System (GCCS) is the designated Command and Control migration system for the DoD. It is an integrated Command, Control, Communications, Computer, and Intelligence (C4I) system capable of supporting all echelons of the US military command structure. GCCS solves C4I interoperability problems between Service components by establishing a Defense Information Infrastructure (DII) Common Operating Environment (COE), as the first step to eliminating stovepipe systems. The AF is responsible for developing four of the modules that will make up this COE, and integration of AF unique applications with the COE. This effort is Budget Activity 7, Operational System Development, because the program develops and implements software for an operational computer network.

(U) Acquisition Strategy: Electronics Systems Center (ESC), Hanscom AFB, MA will manage the overall GCCS-AF program (COE and Crisis Action Planning Evolution) development. The COE development is being performed in-house to support AF contributions to the joint service GCCS program and to support AF mission applications that utilize the COE. The Crisis Action Planning Evolution and associated prototype software development will be commercially developed under the current Command and Control Product Line (CCPL) contract at ESC to deliver a Deliberate and Crisis Action Planning and Execution Segments (DCAPES). During FY 98, a contractor will be selected from the pre-qualified CCPL contractors to develop the DCAPES.

(U) FY 1997

- (U) 4,605 COE Development
- (U) 1,872 Crisis Action Planning Evolution
- (U) 800 Enhanced the Operational Tasking and Priority System (OT&P) to support user identified Functional Process Improvements
- (U) 7,277 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303152F Automated Data Processing Equipment	PROJECT 4485		
<p>(U) <u>FY 1998</u></p> <ul style="list-style-type: none"> - (U) 3,046 COE Development - (U) 2,592 Crisis Action Planning Evolution - (U) 1,103 GCCS Migration Support - (U) 6,741 Total <p>(U) <u>FY 1999</u> (Funding reported in PE 0303150)</p>				
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	7,299	6,820	6,650	TBD
(U) Appropriated Value	7,481	7,820		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-157	-910		
b. SBIR	-25	-169		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-10			
e. Rescissions	-12			
(U) Adjustments to Budget Year since FY 1998 PB			-6,650	
(U) Current Budget Submit/FY 1999 President's Budget	7,277	6,741	0	TBD
 (U) Change Summary Explanation:				
Funding:	FY 99 funds transferred to PE 0303150 due to PE consolidation.			
Schedule:	No change			
Technical:	GCCS is an evolutionary system. The DII COE requirements continually evolve to solve C4I interoperability problems and to support the efficient migration/integration of C4I applications at all levels of command.			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303152F Automated Data Processing Equipment			PROJECT 4485	
(U) C. <u>Other Program Funding Summary in PE 33152F (\$ in Thousands)</u>									
	FY1997	FY1998	FY1999	FY2000	FY2001	FY 2002	FY 2003	To Complete	Total Cost
BA-7, P-50									
(U) Other Procurement, Air Force	9,830	7,079	*	*	*	*	*	*	TBD
(U) Operations and Maintenance, Air Force	14,364	10	*	*	*	*	*	*	TBD
* Reported as part of PE 0303150									
(U) D. <u>Schedule Profile</u>									
		<u>FY 1997</u>			<u>FY 1998</u>		<u>FY 1999</u>		
	1	2 3	4	1	2 3	4	1	2 3	4
1.) (U) Common Operating Environment (COE) Development*									
• Multi-Media			X		X	X			
• Distributed Computing Services			X		X	X			
• Office Automation			X		X	X			
• Management Services			X		X	X			
2.) (U) Crisis Action Planning Enhancement			X			X			
 (U) * Note: The COE development is incremental with scheduled releases based on the Defense Information Systems Agency (DISA) DII COE schedule, FY 99 schedule reported as part of PE 0303150.									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303152F Automated Data Processing Equipment				PROJECT 4485	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Common Operating Environment (COE) Development					4,492	3,046				
(U) Crisis Action Planning Evolution					1,872	2,592				
(U) Operational Testing and Planning (OT&P) Enhancement					913					
(U) GCCS Migration Support						1,103				
(U) Total					7,277	6,741	0*			
*Funding moved to PE 0303150F										
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Product Development Organizations</u>										
Contractor or Government	Contract Method/Type	Award or Obligation	Performing Activity	Project Office	Total Prior to FY 1997	FY 1997	FY 1998	Budget FY 1999	Budget to Complete	Total Program
Performing Activity	Vehicle	Date	EAC	EAC						
(U) Rome Lab	FFP/FCA	Jun 95	N/A	N/A	250	0	0	0		250
(U) Material	various	various	N/A	N/A	1,400	0	0	0		1,400
Systems Group										
(U) Miscellaneous	various	various	N/A	N/A	85	0	0	0		85
(U) Electronic	various	various	N/A	N/A	0	2,177	2,941	*		*13,972
Systems Center										
<u>Support and Management Organizations</u>										
(U) TEMS	OT&M	Jun 95	N/A	N/A	150	1,500	1,200	0		2,850
(U) MITRE	OT&M	Jun 95	N/A	N/A	0	3,600	2,600	0		6,200
(U) Miscellaneous	various	various	N/A	N/A	15		0	0		15
<u>Test and Evaluation Organizations</u>										
(U) Not Applicable										

DATE
February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0303152F Automated Data Processing Equipment

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0303152F Automated Data Processing Equipment				PROJECT 4485		
Government Furnished Property: None										
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>Budget* FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>	
N/A										
Subtotal Product Development				1,735	7,277	6,741	0	0	15,707	
Subtotal Support and Management				165		0	0	0	165	
Subtotal T&E				0	0	0	0	0	0	
(U) Total				1,900	7,277	6,741	0	0	15,872	
* Reported in PE 0303150										
Total program costs reflect only those costs included in this PE through FY98										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303601F MILSTAR Satellite Comm Sys (Space)	PROJECT 2487
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2487 MILSTAR (AF Terminals)	21,752	11,450	2,352	15,736	30,140	2,410	403	800	1,937,934
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: FY96 funding was for Milstar EHF terminals only. Funding includes Milstar EHF terminals, SHF terminals and UHF SATCOM from FY97 and beyond. UHF SATCOM FY96 and prior year funding is in PE 0303606F (UHF SATCOM). SHF terminals prior year funding is in PE 0303605F. All programs prior year funding is included in total program cost.

(U) A. Mission Description and Budget Item Justification

Military Satellite Communications (MILSATCOM) provides worldwide communications to strategic and tactical warfighters. The MILSATCOM Terminals Program contains efforts to develop equipment for Air Force users to communicate over military satellites, including Milstar, Ultra High Frequency (UHF) satellites, and Defense Satellite Communication System (DSCS). Global Broadcast Service (GBS) is a joint program to implement a world-wide, high-capacity satellite broadcast information system that will provide a continuous, high speed, one-way flow of high volume classified and unclassified data, imagery and other information to forces in garrison, deployed, or on the move. Milstar ground and airborne Command Post Terminals (CPT) enhancements, which were procured in FY93 through two contractors, are continuing. The Air Force's Milstar tactical terminals, the Single Channel Anti-Jam Manportable (SCAMP) and the Secure, Mobile, Anti-Jam, Reliable, Tactical Terminal (SMART-T), are funded by the Air Force and procured by the Army. Increasing requirements for UHF satellite capacity, coupled with limited channel capacity, led the Joint Staff to mandate new standards for UHF users that are designed to improve satellite access and efficiency by utilizing Demand Assigned Multiple Access (DAMA) techniques. Development efforts in the UHF SATCOM program are primarily focused on the Network Control System (NCS) and ground and airborne DAMA terminals design and implementation. DSCS terminal procurement efforts sustain and modernize the Ground Mobile Forces terminal and the Jam-Resistant Secure Communications (JRSC) subnet of DSCS. This effort is funded in Budget Activity 7 Operational System Development because it has completed a Milestone III review and is in production.

(U) Acquisition Strategy:

All eighty-one Milstar Command Post terminals have been procured with investment funds. Software enhancements, testing, EDM repair, program, and technical support are continuing. These efforts will be modifications to existing contracts.

(U) FY 1997

- (U) \$4,233 Continued MILSATCOM Terminals program support activities
- (U) \$13,671 Developed CPT upgrades and modifications
- (U) \$506 Continued UHF and AFSATCOM terminal modifications
- (U) \$755 Continued Milstar testing activities

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																												
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303601F MILSTAR Satellite Comm Sys (Space)	PROJECT 2487																																												
<ul style="list-style-type: none"> - (U) \$2,587 Completed Network Control System enhancements and conducted worldwide system test - (U) \$21,752 Total (U) <u>FY 1998 (\$ in Thousands):</u> <ul style="list-style-type: none"> - (U) \$3,324 Continue basic activities to support MILSATCOM terminals - (U) \$6,172 Develop CPT upgrades and processor modifications - (U) \$1,354 Continue Milstar testing activities - (U) \$600 Network Control System Milstandard upgrade - (U) \$11,450 Total (U) <u>FY 1999 (\$ in Thousands):</u> <ul style="list-style-type: none"> - (U) \$1,470 Continue MILSATCOM terminals support activities - (U) \$882 Develop CPT upgrades and processor modifications - (U) \$2,352 Total (U) <u>B. Program Change Summary (\$ in Thousands)</u> <table style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: right; width: 15%;"><u>FY 1997</u></th> <th style="text-align: right; width: 15%;"><u>FY 1998</u></th> <th style="text-align: right; width: 10%;"><u>FY 1999</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998)</td> <td style="text-align: right;">19,289</td> <td style="text-align: right;">12,871</td> <td style="text-align: right;">8,799</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">20,348</td> <td style="text-align: right;">12,871</td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional General Reductions</td> <td style="text-align: right;">-904</td> <td style="text-align: right;">-1,421</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-155</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus and Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td style="text-align: right;">+2,495</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: right;">-32</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-6,447</td> </tr> <tr> <td>(U) Current Budget Submit/FY1999 President's Budget</td> <td style="text-align: right;">21,752</td> <td style="text-align: right;">11,450</td> <td style="text-align: right;">2,352</td> </tr> </tbody> </table> <p style="margin-top: 10px;">(U) Change Summary Explanation: Funding: FY99 adjustment funded higher priority AF and DoD requirements and inflation reductions.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	(U) Previous President's Budget (FY1998)	19,289	12,871	8,799	(U) Appropriated Value	20,348	12,871		(U) Adjustments to Appropriated Value				a. Congressional General Reductions	-904	-1,421		b. SBIR	-155			c. Omnibus and Other Above Threshold Reprogram				d. Below Threshold Reprogramming	+2,495			e. Rescissions	-32			(U) Adjustments to Budget Years Since FY1998 PB			-6,447	(U) Current Budget Submit/FY1999 President's Budget	21,752	11,450	2,352
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>																																											
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(U) Current Budget Submit/FY1999 President's Budget	21,752	11,450	2,352																																											
Project 2487	Page 2 of 5 Pages	Exhibit R-2 (PE 0303601F)																																												

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0303601F MILSTAR Satellite Comm Sys (Space)	PROJECT 2487
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Schedule: Not Applicable.
 Technical: Not Applicable

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
(U) Aircraft Procurement, Air Force, P-58	21,111	15,009	10,364	25,505	35,243	81,536	101,450	Cont	Cont
(U) Other Procurement, Air Force, P-70	58,356	18,087	28,233	44,541	32,187	28,174	21,455	Cont	Cont

Procurement funding does not include spares.

Related RDT&E: PE 64479F Milstar LDR/MDR Satellite Communications
 PE 33110F Defense Satellite Communications System (DSCS)
 PE 63854F Global Broadcast Service

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) CPT Upgrades Delivery and Production												x
(U) CPT IOT&E Phase II			x									
(U) CPT IOC I			x									
(U) SCAMP Deliveries Begin									x			
(U) SMART-T Low-Rate Initial Production Begins		x										
(U) UHF Network Control System												
(U) Deliveries		x	x									
(U) Worldwide System Test			x									
(U) Airborne DAMA Terminal Upgrade												
(U) Contract Award/Option						x				x		
(U) Deliveries		x	x	x			x	x	x	x	x	x
(U) Ground DAMA Terminal Deliveries			x	x	x	x	x					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303601F MILSTAR Satellite Comm Sys (Space)			PROJECT 2487		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) CPT Upgrades					13,671	6,172	882			
(U) UHF Upgrades					506					
(U) Testing Support/Studies					755	1,354				
(U) SPO Ops (PSA, TDY, Trng, Sup/Equip, Ktr Spt/Conv)					4,233	3,324	1,470			
(U) Network Control System World Wide system test					2,587	600				
(U) Total					21,752*	11,450	2,352			
* Does not reflect BTR of -\$700,000.										
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Raytheon Corp	FPIF/FFP	Jun 85	891,382	891,382	870,453	9,504	2,965	882	7,578	891,382
Rockwell	CPIF	Aug 93	43,068	43,068	43,068	0	0	0	0	43,068
Miscellaneous	Various	Various	N/A	N/A	649,764	2,340	221	0	29,114	681,439
ViaSat	C/FFP	Oct 95	3,087	3,087	0	2,587	500	0	0	3,087
<u>Support and Management Organizations</u>										
MITRE	CPAF	Various	N/A	N/A	92,958	3,402	3,700	672	4,649	105,381
SPT Contractors	Various	Various	N/A	N/A	151,985	2,181	1,396	378	2,110	158,050
Tecolote	Various	Various	N/A	N/A	1,380	0	586	0	0	1,966
Miscellaneous	Various	Various	N/A	N/A	17,850	1,178	728	420	2,617	22,793
<u>Test and Evaluation Organizations</u>										
Wright-Labs	AF-616*	N/A	N/A	N/A	20,091	522	1,354	0	3,418	25,385
Project 2487					Page 4 of 5 Pages			Exhibit R-3 (PE 0303601F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0303601F MILSTAR Satellite Comm Sys (Space)				PROJECT 2487	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Miscellaneous	Various	Various	N/A	N/A	5,345	38	0	0	0	5,383
<u>Government Furnished Property:</u> N/A										
<u>Product Development Property:</u> N/A										
<u>Support and Management Property:</u> N/A										
<u>Test and Evaluation Property:</u> N/A										
Subtotal Product Development					1,563,285	14,431	3,686	882	36,692	1,618,976
Subtotal Support and Management					264,173	6,761	6,410	1,470	9,376	288,190
Subtotal Test and Evaluation					25,436	560	1,354	0	3,418	30,768
Total Project					1,852,894	21,752	11,450	2,352	49,486	1,937,934
* An AF-616 is an internal transfer of funds between AF organizations.										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	0	0	27,056	18,155	10,695	9,776	7,806	TBD	TBD
4689 Global Access Architecture	0	0	24,899	6,637	8,750	9,776	7,806	TBD	TBD
4690 VHF Integration	0	0	2,157	11,518	1,945	0	0	0	15,620
Quantity of RDT&E Articles	0	0	0	1*	0	0	0	0	1*

* Mod kit not separately priced.

(U) A. Mission Description and Budget Item Justification

4689: Global Air Traffic Management: This effort supports global air traffic operations through the development and acquisition of aviation equipment that will meet the DoD mission and comply with appropriate civil standards. This project will ensure interoperability between multiple platforms and air traffic control functions within the DoD and Federal Aviation Administration (FAA). Common system engineering support, architecture analyses and evaluations will address the requirements of the special operations fleet, fighters, uninhabited air vehicles, common flight management systems, and special mission aircraft. The Global Air Traffic Operations / Mobility Command and Control (GATO/MC2) System Program Office (SPO) will assist the Major Commands (MAJCOMs) in the development of operational architectures to meet evolving GATM requirements. The SPO will develop and maintain an acquisition master plan addressing performance, schedule, and cost of various aircraft and C2 programs. In addition, this project will formulate a product catalog providing MAJCOMs and SPOs a readily available source of certifiable common GATM systems to allow a rapid acquisition of the necessary equipment and logistics support. This project supports the definition of requirements for ACAT III projects across multiple weapon systems. Funding was sharply increased in FY99 in recognition of need to perform architectural analyses. This endeavor consists of low technical risk system engineering efforts supporting fielded weapon systems, utilizing Commercial Off-The-Shelf (COTS) and Non-Developmental Items (NDI), and is assigned to Budget Activity 7, Operational Systems Development.

4690: VHF Integration: Program integrates VHF communication and navigation equipment onto the MC-130H Combat Talon II aircraft to comply with changing airspace access criteria. Project investigates cost-effective solutions such as integration of Multi Mode receiver (MMR) and modification of the Very High Frequency (VHF) military radio to add 8.33 kHz channel spacing capability. The MMR may incorporate a Microwave Landing System (MLS), Protected Instrument Landing System and Differential Global Positioning System. These modifications would enable the MC-130H and other Air Force Special Operations Command (AFSOC) aircraft to comply with changing International Civil Aviation Organization (ICAO) airspace access criteria. Effort includes engineering design work, mod kit design, and kit proofing. The MC-130H and other Special Operations Forces (SOF) aircraft have software that is highly unique and specialized. Modification of the software will involve changing the code, testing the changes, and updating software documentation and maintenance technical orders. This program will develop mission essential capability for fielded weapon systems and is assigned Budget Activity 7, Operational Systems Development.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)
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(U) **Acquisition Strategy:**
4689: The GATM Global Access Architecture acquisition strategy enables the GATO/MC2 SPO to guide equipment acquisition supporting global air traffic operations. The SPO will ensure standardization and certification of USAF platforms/systems that operate in the national and global air traffic environments. The SPO will also provide technical expertise and interface with appropriate product/support centers, battle labs, and Department of Defense (DOD) research and development facilities in the execution of assigned tasks. Program Research and Development Agreements (PRDAs), Cooperative Research and Development Agreements (CRDAs), and Indefinite Delivery/Indefinite Quantity (ID/IQ) contracts will be competitively awarded.
4690: The integration acquisition strategy for AFSOC communication/navigation modifications enables the GATO/MC2 SPO to use existing contracts, when possible, to assist in the technical design and integration. The modifications will be accomplished under the SOF Integrated Weapons System Support Program (IWSSP) contract.

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998)	0	0	0	0
(U) Appropriated Value				
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions				
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY1998 PB			27,056	TBD
(U) Current Budget Submit/1999 President's Budget	0	0	27,056	TBD

(U) Change Summary Explanation:
 Funding: FY97 reprogramming was approved by Congress and is not reflected in these numbers. It includes a \$3,036K increase to support the development of a common architecture for Communication, Navigation, Surveillance / Air Traffic Management (CNS/ATM) requirements. Common system engineering support included \$27,056K in FY99. Such a large investment in one year attempts to accomplish architectural analyses for multiple platforms, providing data in the following years when it is needed the most. FY 99 New Start Program

Schedule: N/A

Technical: N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)					
(U) C. Other Program Funding Summary (\$ in Thousands)									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) Aircraft Procurement, AF, BA-7, C-5 Mods, Avionics Modernization Program, PE 0401119F				107,761	59,942	127,779	111,260	189,353	596,095
(U) RDT&E, AF, BA-7, Avionics Modernization Program, PE 0401119F, C-5 Airlift Squadrons		9,751	48,904						58,655
(U) Aircraft Procurement, AF, BA-7, AFSOC VHF Integration, PE 0404011F					3,028	2,147	1,086		6,261
(U) Aircraft Procurement, AF, BA-7, VC-25, PE 0401314F			5,447	9,000		1,000	1,000		16,447
(U) Aircraft Procurement, AF, BA-7, KC-135, PE 0401218F			78,000	137,000	168,000	166,000	209,000		758,000
(U) Aircraft Procurement, AF, BA-7, KC-10, PE 040219F			19,847	25,896	27,091	32,470	18,300		123,604
(U) Aircraft Procurement, AF, BA-7, E-3, PE 0207417F			3,000					TBD	TBD
(U) Aircraft Procurement, AF, BA-7, E-4, PE 0302015F			7,000					TBD	TBD
(U) Aircraft Procurement, AF, BA-7, C-21, PE 0401314F			43,300	34,120	35,160			TBD	TBD
(U) Aircraft Procurement, AF, BA-7, Other, GATO/MC2 SPO, PE 0305099F		1,800							1,800
(U) Aircraft Procurement, AF, BA-7, C-32, PE 0401314F					8,700	6,000			14,700
(U) Aircraft Procurement, AF, BA-7, C-9, PE 0401314F			3,910	20,050	14,350	23,900	13,130	110	75,450
(U) Aircraft Procurement, AF, BA-7, C-20, PE 0401314F			3,340	25,350	50	7,600	10,200		46,540
(U) Aircraft Procurement, AF, BA-7, C-141, PE 0401119F			18,200	1,800					20,000

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) GATM (See individual R-2 exhibits for schedule profiles)												
(U) VHF Integration (See individual R-2 exhibits for schedule profiles)												

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)	PROJECT 4689
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4689 Global Access Architecture	0	0	24,899	6,637	8,750	9,776	7,806	TBD	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

4689: Global Air Traffic Management: This effort supports global air traffic operations through the development and acquisition of aviation equipment that will meet the DoD mission and comply with appropriate civil standards. This project will ensure interoperability between multiple platforms and air traffic control functions within the DoD and Federal Aviation Administration (FAA). Common system engineering support, architecture analyses and evaluations will address the requirements of the special operations fleet, fighters, uninhabited air vehicles, common flight management systems, and special mission aircraft. The Global Air Traffic Operations / Mobility Command and Control (GATO/MC2) System Program Office (SPO) will assist the Major Commands (MAJCOMs) in the development of operational architectures to meet evolving GATM requirements. The SPO will develop and maintain an acquisition master plan addressing performance, schedule, and cost of various aircraft and C2 programs. In addition, this project will formulate a product catalog providing MAJCOMs and SPOs a readily available source of certifiable common GATM systems to allow a rapid acquisition of the necessary equipment and logistics support. This project supports the definition of requirements for ACAT III projects across multiple weapon systems. Funding was sharply increased in FY99 in recognition of need to perform architectural analyses. This endeavor consists of low technical risk system engineering efforts supporting fielded weapon systems, utilizing Commercial Off-The-Shelf (COTS) and Non-Developmental Items (NDI), and is assigned to Budget Activity 7, Operational Systems Development.

(U) FY 1997 (\$ in Thousands):

– (U) \$ 0 Total

(U) FY 1998 (\$ in Thousands):

– (U) \$ 0 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$ 4,698 Continue system architecture analyses and evaluations for the various platforms
- (U) \$ 9,357 Begin development of common system architectures
- (U) \$ 8,625 Initiate miniaturization and modular system prototype developments
- (U) \$ 2,219 Begin GPS/NAVWAR integration evaluations
- (U) \$24,899 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)	PROJECT 4689
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998)	0	0	0	0
(U) Appropriated Value				
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions				
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY1998 PB			24,899	TBD
(U) Current Budget Submit/1999 President's Budget	0	0	24,899	TBD

(U) Change Summary Explanation:

Funding: FY97 reprogramming was approved by Congress and is not reflected in these numbers. It includes a \$3,036K increase to support the development of a common architecture for Communication, Navigation, Surveillance / Air Traffic Management (CNS/ATM) requirements. Common system engineering support included \$27,056K in FY99. Such a large investment in one year attempts to accomplish architectural analyses for multiple platforms, providing data in the following years when it is needed the most. FY99 New Start Program

Schedule: N/A

Technical: N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)				PROJECT 4689	
(U) C. Other Program Funding Summary (\$ in Thousands)									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) Aircraft Procurement, AF, BA-7, C-5 Mods, Avionics Modernization Program, PE 0401119F				107,761	59,942	127,779	111,260	189,353	596,095
(U) RDT&E, AF, BA-7, Avionics Modernization Program, PE 0401119F, C-5 Airlift Squadrons		9,751	48,904						58,655
(U) Aircraft Procurement, AF, BA-7, AFSOC VHF Integration, PE 0404011F					3,028	2,147	1,086		6,261
(U) Aircraft Procurement, AF, BA-7, VC-25, PE 0401314F			5,447	9,000		1,000	1,000		16,447
(U) Aircraft Procurement, AF, BA-7, KC-135, PE 0401218F			78,000	137,000	168,000	166,000	209,000		758,000
(U) Aircraft Procurement, AF, BA-7, KC-10, PE 040219F			19,847	25,896	27,091	32,470	18,300		123,604
(U) Aircraft Procurement, AF, BA-7, E-3, PE 0207417F			3,000					TBD	TBD
(U) Aircraft Procurement, AF, BA-7, E-4, PE 0302015F			7,000					TBD	TBD
(U) Aircraft Procurement, AF, BA-7, C-21, PE 0401314F			43,300						
(U) Aircraft Procurement, AF, BA-7, Other, GATO/MC2 SPO, 0305099F		1,800							1,800
(U) Aircraft Procurement, AF, BA-7, C-32, PE 0401314F					8,700	6,000			14,700
(U) Aircraft Procurement, AF, BA-7, C-9, PE 0401314F			3,910	20,050	14,350	23,900	13,130	110	75,450
(U) Aircraft Procurement, AF, BA-7, C-20, PE 0401314F			3,340	25,350	50	7,600	10,200		46,540
(U) Aircraft Procurement, AF, BA-7, C-141, PE 0401119F			18,200	1,800					20,000
Project 4689									
Page 7 of 15 Pages									
Exhibit R-2 (PE 0305099F)									

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)

DATE **February 1998**

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0305099F Global Air Traffic Management (GATM) PROJECT
4689

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Development of Common System Architectures										X		
(U) Miniaturization and Modular System Prototype Development										X		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)				PROJECT 4689		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>		<u>FY 1999</u>			
(U)	Prototypes/System Developments						8,625			
(U)	Common System Architecture Analyses						2,483			
(U)	Common System Architecture Development						9,357			
(U)	Systems Engineering/Technical Support						1,918			
(U)	GPS/NAVWAR Integration Evaluations						2,219			
(U)	Program Management Support						240			
(U)	Travel						57			
(U)	Total			0	0		24,899			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations:</u> Not applicable										
<u>Support and Management Organizations</u>										
ESC	TBD							24,899	TBD	TBD
<u>Test and Evaluation Organizations</u>										
TBD	TBD							TBD	TBD	TBD
Project 4689				Page 9 of 15 Pages				Exhibit R-3 (PE 0305099F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)	PROJECT 4689
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: None

<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development										
Subtotal Support and Management								24,899	TBD	TBD
Subtotal Test and Evaluation								TBD	TBD	TBD
Total Project					0	0	0	24,899	TBD	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)				PROJECT 4690	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4690 VHF Integration	0	0	2,157	11,518	1,945	0	0	0	15,620
Quantity of RDT&E Articles	0	0	0	1*	0	0	0	0	1*

* Mod kit not separately priced.

(U) A. Mission Description and Budget Item Justification

4690: VHF Integration: Program integrates VHF communication and navigation equipment onto the MC-130H Combat Talon II aircraft to comply with changing airspace access criteria. Project investigates cost-effective solutions such as integration of Multi Mode Receiver (MMR) and modification of the Very High Frequency (VHF) military radio to add 8.33 kHz channel spacing capability. The MMR may incorporate a Microwave Landing System (MLS), Protected Instrument Landing System and Differential Global Positioning System. These modifications would enable the MC-130H and other AFSOC aircraft to comply with changing International Civil Aviation Organization (ICAO) airspace access criteria. Effort includes engineering design work, mod kit design, and kit proofing. The MC-130H and other Special Operations Forces (SOF) aircraft have software that is highly unique and specialized. Modification of the software will involve changing the code, testing the changes, and updating software documentation and maintenance technical orders. This program will develop mission essential capability for fielded weapon systems and is assigned Budget Activity 7, Operational Systems Development.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 0 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$ 0 Total

(U) FY 1999 (\$ in Thousands):

- (U) 1,157 Systems engineering
 - (U) 700 Software engineering
 - (U) 300 Management and Support
 - (U) \$ 2,157 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)	PROJECT 4690
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998)	0	0	0	0
(U) Appropriated Value				
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions				
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions				
(U) Adjustments to Budget Years Since FY1998 PB			2,157	
(U) Current Budget Submit/1999 President's Budget	0	0	2,157	15,620

(U) Change Summary Explanation:
 Funding: FY 99 New Start Program

 Schedule: N/A

 Technical: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)	PROJECT 4690
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) Aircraft Procurement, AF, Special Operations Forces, PE 0404011F					3,028	2,147	1,086	0	6,261

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Contract Award									X			
(U) PDR										X		
(U) CDR												X
(U) First Article Testing (2Q/00)												
(U) Begin Kit Production (3Q/00)												

UNCLASSIFIED

RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)	PROJECT 4690
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Software engineering			700
(U) System engineering			1,157
(U) Management and Support			300
(U) Total	0	0	2,157

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Product Development Organizations

IWSSP	TBD	Dec 98			6,807	0	0	0	1,857	11,763	13,620
Contractor											

Support and Management Organizations

WR-ALC/LU	TBD							100	800	900
ASC/LU	TBD							200	900	1,100

Test and Evaluation Organizations

TBD								TBD	TBD	TBD
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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305099F Global Air Traffic Management (GATM)				PROJECT 4690	
(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)									
Government Furnished Property: Government will provide VHF radios and Multi Mode Receivers to the contractor.									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
TBD									TBD
<u>Support and Management Property</u>									
TBD									TBD
<u>Test and Evaluation Property</u>									
TBD									TBD
Subtotal Product Development							1,857	11,763	13,620
Subtotal Support and Management							300	1,700	2,000
Subtotal Test and Evaluation							TBD	TBD	TBD
Total Project				0	0	0	2,157	13,463	15,620

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305110F Satellite Control Network (Space)				PROJECT 3276	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3276 Satellite Control Network	67,804	73,496	56,622	100,645	101,383	98,404	94,640	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

(U) The Air Force Satellite Control Network (AFSCN) mission is to fly operational USAF and other DoD satellites. The AFSCN also provides launch & early orbit tracking operations in support of all major US launches. Air Force Space Command (AFSPC) performs operations and maintenance and Air Force Materiel Command (AFMC) performs modernization and sustainment of the system to meet requirements validated by a HQ USAF approved Operational Requirements Document (ORD). This effort funds the development and acquisition of this integrated national satellite telemetry, tracking, commanding, and data relay capability to meet the requirements of the growing inventory of operational and developmental DoD, National, Civil, and foreign satellite systems. Improvement and Modernization efforts in command & control, communications, and range elements of the AFSCN will ensure DoD space systems are operationally ready to support the CINCs' warfighting requirements.

(U) The AFSCN consists of four segments: Command & Control, Communications, Range, and Support. The system is a global infrastructure of control centers, remote tracking stations, and communications links that provide the highly reliable command and control, communications, and range systems required to support the nation's surveillance, navigation, communications, and weather satellite operations. The AFSCN is the DoD common user network that provides satellite state-of-health, tracking, telemetry, and commanding (TT&C) for the following operational satellite systems: DMSP, GPS, DSCS, DSP, FLTSAT, MILSTAR, UHF F/O, Skynet, NATO II/IV, and Classified Programs.

(U) AFSCN Improvement and Modernization (I&M): AFSCN I&M is an on-going program of replacements and upgrades which will replace non-standard, unsupportable equipment with more reliable, maintainable and standardized hardware and software. This new equipment will enable AFSPC satellite operations to be performed with fewer, lower skilled personnel and will significantly reduce hardware/software maintenance costs. The principal efforts within this program are: Network Operations Upgrades (Command & Control System Upgrades), Communications Upgrades, and Range Upgrades.

(U) NETWORK OPERATIONS UPGRADES: The current Resource Management System (RMS), which deconflicts and allocates network telemetry, tracking & command assets to support operational space vehicles, will be replaced with an automated, Year 2000-compliant system which includes network resource scheduling and orbit analysis functions to include ephemeris and events generation, radio frequency interference detection and collision avoidance. This evolution offers tremendous potential for reducing satellite control O&M costs through enhanced commonality and standardization, simplified operations, and automation. Commercial off-the-shelf (COTS) hardware and software will be procured for the new Resource Management System. The software portions will be modified to meet AFSPC's operational requirements.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0305110F Satellite Control Network (Space)	3276
<p>(U) COMMUNICATIONS UPGRADES: This effort will transition the current, costly point-to-point AFSCN communications network to a communications grid system that integrates government and commercial networks as technology becomes available. Several standardization efforts are being implemented to improve and modernize the communications and ground segment elements of the AFSCN, including: Archival recording systems to replace obsolete, manpower-intensive analog equipment with automated, standardized digital COTS systems; a Centralized Control and Monitor (CC&M) system which will consolidate communications operations, provide remote control of tracking station equipment, and increase fault detection and isolation capabilities to reduce O&M costs; Wide Area Network Interface Units (WANIU) which standardize hardware and reduce O&M costs for performing multiplexing functions in the AFSCN, as well as provide an Asynchronous Transfer Mode (ATM) interface; and Operational Switch Replacement (OSR) to provide increased capacity, reliability, data quality, and user access.</p> <p>(U) RANGE UPGRADES: This effort will upgrade the current Automated Remote Tracking Station (ARTS) and other Range assets. Several integrated projects will standardize the remote tracking stations, upgrade and/or replace outdated equipment in order to reduce failures, correct operational deficiencies, and reduce operating and sustainment costs.</p> <p>(U) This effort is in Budget Activity 7, Operational System Development, because it supports a fielded system.</p> <p>(U) ACQUISITION STRATEGY: The primary objective of the AFSCN I&M program is to reduce the cost of satellite control operations while maintaining or improving reliability, maintainability, operability, and capability of current systems. A combination of performance-based specifications and commercial/industrial specifications and standards was used for these acquisitions and was tailored to state only the Government's minimum performance needs. All development contracts were competitively awarded and utilized commercial practices and streamlining to the maximum extent possible.</p> <p>The AFSCN utilized multiple development contracts in the past. Starting in FY96, a new streamlined contracting strategy was implemented with the award of three new contracts. The new strategy resulted in the Range & Communications Development Contract (RCDC), the Network Operations Upgrade Contract (NOUC), and the Network Integration Contract (NIC). Integration efforts had previously been spread across functional and contracting lines; but with the new AFSCN contracting strategy, the NIC contractor will be responsible for inter-segment integration. Development upgrades will be designed to be flexible in meeting new satellite program requirements while minimizing sustainment costs by taking advantage of development efforts in satellite control over a large number of government and non-government development activities. It is believed that these objectives can best be reached by developing systems with an open software design and a distributed system architecture using COTS products wherever feasible.</p>		
Project 3276	Page 2 of 8 Pages	Exhibit R-2 (PE 0305110F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0305110F Satellite Control Network (Space)	3276
(U) <u>FY 1997 (\$ in Thousands)</u>		
(U) \$22,349	<u>Network Operations Upgrades (Command and Control System Upgrades):</u> (U) Continued software development of Resource Scheduling, Basic Orbit Service, and Network Performance capabilities. Began effort to field and sustain an early schedule input and dissemination capability until RMS delivery. Initiated effort to move the primary orbit analysis functions of RMS to Falcon AFB for use by the Inter-Range Operations organization. Continued development of the common HMI and the common satellite control architecture and its underlying requirements base. Initiated effort to standardize satellite operations training for all AFSPC satellite control systems. Continued developing priority user-requested modifications to command and control systems.	
(U) \$32,266	<u>Communications Upgrades:</u> (U) Continued supporting hardware and software integration of standardized COTS archival recorder units at Remote Tracking Stations (RTS). Continued development of WANIU and began operational testing of prototype in AFSCN. Continued CC&M development. Continued Operational Switch Replacement studies and requirements analysis.	
(U) \$11,189	<u>Network Integration and Systems Engineering:</u> (U) Continued system engineering and integration of hardware/software to meet evolving satellite program requirements at Operational Control Nodes (OCNs) and RTSs.	
(U) \$2,000	<u>Approved Below Threshold Reprogramming</u> (U) Funds have been identified to support Combat Survivor Evader Locator (CSEL).	
(U) \$67,804	Total	
(U) <u>FY 1998 (\$ in Thousands)</u>		
(U) \$20,423	<u>Network Operations Upgrades (Command and Control System Upgrades):</u> (U) Develop, test, and field Resource Scheduling, Basic Orbit Service, Control and Status, and Network Performance capabilities in primary locations. Begin implementation of additional orbit service capabilities into RMS. Complete common HMI and common satellite control architecture study to finish SSCS effort and make results available to satellite SPOs.	
(U) \$33,908	<u>Communications Upgrades:</u> (U) Continue supporting hardware and software installation of standardized COTS archival recorder units at RTSs. Continue development, integration, and test of WANIUs into the AFSCN. Complete CC&M development and deliver baseline system. Begin development of Operational Switch Replacement.	
(U) \$12,167	<u>Network Integration and Systems Engineering:</u> (U) Continue system engineering and integration of hardware/software to meet evolving satellite program requirements at OCNs and RTSs.	
(U) \$6,998	<u>Approved Below Threshold Reprogramming:</u> Funds have been identified to support Combat Survivor Evader Locator (CSEL) and Global Positioning System (GPS) III modernization.	
(U) \$73,496	Total	
Project 3276	Page 3 of 8 Pages	Exhibit R-2 (PE 0305110F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0305110F Satellite Control Network (Space)	3276
(U) <u>FY 1999 (\$ in Thousands)</u>		
(U) \$5,544	<u>Network Operations Upgrades (Command and Control System Upgrades):</u>	
	(U) Begin Resource Scheduling integration and test of orbit service at back-up operational location.	
(U) \$36,936	<u>Communications Upgrades:</u>	
	(U) Complete Archival Recorder System and CC&M development projects. Continue developing Operational Switch Replacement. Support WANIU installation at RTSs and OCNs.	
(U) \$3,180	<u>Range Upgrades:</u>	
	(U) Begin development of antenna upgrades. Current 1960's technology antennas are very expensive to maintain. Modern designs are available off-the-shelf to provide increased performance, reduced interference (required by FCC allocation of adjacent frequencies to Commercial users), and multi-frequency alternatives.	
(U) \$10,962	<u>Network Integration and Systems Engineering:</u>	
	(U) Continue system engineering an integration of hardware/software to meet evolving satellite program requirements at OCNs and RTSs.	
(U) \$56,622	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305110F Satellite Control Network (Space)	PROJECT 3276
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	82,640	80,011	104,061	Continuing
(U) Appropriated Value	86,960	80,011		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-2,062	-4513		
b. SBIR	-2,258	-2002		
c. Omnibus and Other Above Threshold Reprogram	-14,000			
d. Below Threshold Reprogramming	-700			
e. Rescissions	-136			
(U) Adjustments to Budget Years since FY 1998 PB			-47,439	
(U) Current Budget Submit/1999 President's Budget	67,804	73,496	56,622	Continuing

(U) Change Summary Explanation (\$ in Thousands):

Funding: The following FY97 and FY98 reprogrammings were accomplished after database lock and are not reflected in the amounts above: FY97 -- \$2,000 to support CSEL program; FY98 -- \$6,998 reprogrammed to support CSEL (\$1,999) and GPS modernization (\$4,999); FY99 adjustments fund higher Air Force and DoD priorities.

Schedule: RC3M start delayed two years to FY00; C&S Processor start delayed two years to FY00

Technical: Development of Standard Satellite Control Subsystem (SSCS), a common core C2 upgrade for satellite control, was restructured and descoped, and will conclude in FY98; descoped antenna upgrades effort in identification and implementation of improved ranging and modulation techniques.

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement, AF; Budget Activity: 03; P-65; AFSCN	7,237	22,459	26,007	23,987	32,658	40,850	41,771	Continue	Continue

Related RDT&E:

(U) Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305110F Satellite Control Network (Space)	PROJECT 3276
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
<u>Communications Upgrades</u>												
Archival CDR			X									
RTS archival IOC									X			
CC&M CDR				X								
CC&M IOC									X			
WANIU CDR							X					
OSR CDR								X				
<u>Network Operations Upgrades</u>												
Resource Management CDR				X								
Resource Management IOC										X		
<u>Range Upgrades</u>												
Start antenna upgrades										X		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305110F Satellite Control Network (Space)				PROJECT 3276		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Network Ops Upgrades (Command and Control Upgrades)					22,349	20,423	5,544			
(U) Communications Upgrades					32,266	33,908	36,936			
(U) Range Upgrades					0	0	3,180			
(U) Network Integration and Systems Engineering					11,189	12,167	10,962			
(U) Approved Below Threshold Reprogramming					2,000	6,998	0			
(U) Total					67,804	73,496	56,622			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC*	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	FY 1999	To Complete	Total Program
<u>Product Development Organizations</u>										
Multiple	Multiple	Multiple	72,296	72,296	72,296	0	0	0	0	72,296
Lockheed Martin	C/CPAF	Mar 96	94,004	175,140		32,266	33,908	36,936	continuing	continuing
Lockheed Martin	C/CPAF	Apr 96	52,258	118,400		22,349	20,423	5,544	continuing	continuing
Range Upgrades	TBD	TBD		205,057		0	0	3,180	continuing	continuing
Lockheed Martin	C/CPAF	May 96	66,700	74,050		11,189	12,167	10,962	continuing	continuing
*Only includes projections/options exercised to date										
<u>Support and Management Organizations</u>										
N/A										
<u>Test and Evaluation Organizations</u>										
N/A										
Project 3276			Page 7 of 8 Pages				Exhibit R-3 (PE 0305110F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development			PE NUMBER AND TITLE 0305110F Satellite Control Network (Space)				PROJECT 3276	
	Performing Activity <u>EAC*</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	To Complete	Total Program
Government Furnished Property: N/A								
Subtotal Product Development	285,258	644,943	72,296	65,804	66,498	56,622	continuing	continuing
Subtotal Support and Management								
Subtotal Test and Evaluation								
Subtotal Reprogramming				2,000	6,998			
Total Project	285,258	644,943	72,296	67,804	73,496	56,622	continuing	continuing

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305111F Weather Service	PROJECT 2738
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2738 Weather Service	4,801	8,411	10,649	13,634	11,670	11,824	12,045	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

(U) This program provides for the modification, sustainment, and acquisition of meteorological hardware and software needed to support the observing and forecasting needs of worldwide Air Force and Army operations, as well as Special Operation Forces (SOF) and other government agency support. Efforts include: (a) Cloud Depiction and Forecast System II (CDFS II), replaces logistically unsupportable mainframe computers at the Air Force Weather Agency (AFWA), Offutt AFB and upgrades satellite data processing, cloud depiction and forecasting, and classified weather support functions for operational commanders and national programs; (b) Global Theater Weather Analysis and Prediction System (GTWAPS), acquires theater weather models and associated hardware to improve the AFWA theater support capabilities; (c) Tactical Weather Radar (TWR), provides lightweight, portable Doppler weather radar to support deployed combat operations worldwide; (d) Space Weather Analysis and Forecast System (SWAFS), replaces aging 55th Space Weather Squadron (55SWXS, AFSPC) hardware and software to move to an open, efficient computing environment; (e) Meteorological Operations Capability (MOC), which builds upon weather systems successfully integrated into operational C4I systems and supports the "train as you fight" concept by assuring fixed and deployable systems are the same. (f) Satellite Data Handling System II (SDHS II) will retrieve satellite data and meteorological fields from a centralized data base to a graphical user interface capable of 3-D and 4-D visualization. Provides operators and commanders better situational awareness of conditions in their operating environment and battlespace. This effort is in Budget Activity 7, Operational System Development, because it supports software development and system tests associated with the upgrade and replacement of currently operational systems, systems already in production, and systems with approved production funds in the DoD budget.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997 (\$ in Thousands):

- (U) 2,977 CDFS II: Continued development of cloud depiction and forecast software, prepare for FY98 production/integration contract award.
- (U) 1,599 GTWAPS: Milestone decision (3QFY97) and awarded development contract (1FY98).
- (U) 225 SWAFS: Prepared Milestone I/II/III documentation
- (U) 4,801 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0305111F Weather Service	February 1998 2738
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) 4,658 CDFS II: Continue to create, rewrite and host software modules.- (U) 2,861 GTWAPS: Continue software development for IOC 1.- (U) 654 TWR: Milestone I/III documentation.- (U) 238 MOC: Prepare and conduct Milestone I/III for forecast system.- (U) 8,411 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none">- (U) 5,505 CDFS II: Continue development of cloud depiction and forecast software.- (U) 1,967 GTWAPS: Continue software development for incremental IOCs.- (U) 250 TWR: SPO support.- (U) 2,587 MOC: Begin software development for forecast system. Prepare documentation for MS I/III for observing system.- (U) 340 SDHS II: Assessment of operational alternative study.- (U) 10,649 Total		
Project 2738	Page 2 of 6 Pages	Exhibit R-2 (PE 0305111F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305111F Weather Service	PROJECT 2738
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 BP)	4,919	9,057	8,424	Cont.
(U) Appropriated Value	5,126	9,057		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-132	-490		
b. SBIR	-85	-156		
c. Omnibus or Other Above Threshold Reprogramming	0			
d. Below Threshold Reprogramming	-100			
e. Rescissions	-8			
(U) Adjustments to Budget Years Since FY 1998 PB			2,225	
(U) Current Budget Submit/FY1999 President's Budget	4,801	8,411	10,649	Cont.

(U) Change Summary Explanation:

Funding: FY 99 change is due to transfer from other procurement to RDT&E. (\$2,439).
 Schedule: None.
 Technical: None.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305111F Weather Service	PROJECT 2738
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>
(U) Other Procurement, AF (35111F WSC 833070)	17,643	21,256	18,581	26,591	27,536	29,309	28,101	Cont.	Cont.

Only includes procurement funds for investment programs described in this R-2 Exhibit.

Related RDT&E:

- (U) PE #603707F, Weather Systems Advanced Development
- (U) PE #602601F, Phillips Lab Exploratory Development
- (U) PE #305160F, Defense Meteorological Satellite Program
- (U) PE #603434F, National Polar-orbiting Operational Environmental Satellite System
- (U) PE #207438F, Theater Battle Management C4I
- (U) PE #208006F Air Force Mission Planning System

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) CWS TFS Software Complete	X											
(U) GTWAPS Milestone I/II/III			X									
(U) TWR Milestone I/III				X								
(U) MOC Milestone I/III						X						
(U) SWAFS Milestone I/II/III											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305111F Weather Service			PROJECT 2738		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
			<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>					
(U) 1st Article Development			0	525	100					
(U) System Software Integration			214	285	66					
(U) System Engineering Support			799	798	842					
(U) Contractor Engineering Support			485	452	899					
(U) Software Development			3,004	5,095	7,552					
(U) Travel			78	101	140					
(U) Program Management Support			231	1155	1050					
(U) Laboratory Support			0	0	0					
(U) Total			4,801	8,411	10,649					
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Phillips Lab	MIPR	May 94	270	270	270	0	0	0	0	270
CalTech	LOE	Jun 94	1,172	1,172	1,172	0	0	0	0	1,172
CSC	LOE	Jan 94	2,127	2,127	2,127	0	0	0	0	2,127
GTE	FFP/PR	Oct 90	13,064	13,064	13,064	0	0	0	0	13,064
PRISM (Raytheon)	LOE	Jan 93	3,497	3,497	3,497	0	0	0	0	3,497
PRISM (Hughes)	LOE	Jan 93	3,396	3,396	3,121	0	275	0	0	3,396
Sterling	CPAF	Jun 95	17,196	17,196	4,600	3,186	4,180	5,230	0	17,196
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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY					PE NUMBER AND TITLE					PROJECT
7 - Operational System Development					0305111F Weather Service					2738
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Air Weather Svc (CDFS II related work)	MIPR	4FY95	2,900	2,900	2,900	0	0	0	0	2,900
Hughes DNA	MIPR	Sep 95 Jan 95	1,682 100	1,682 100	1,682 100	0 0	0 0	0 0	0 0	1,682 100
CCPL/ESC TRW	LOE FFP	1FY98 Dec 97	TBD 3,370	TBD 3,370	0 0	0 0	396 1,953	2,052 1,417	Cont. 0	Cont 3,370
<u>Support and Management Organizations</u>										
Electronic Systems Center (ESC)					632	520	1,050	871	Cont	Cont
Space and Missile Center (SMC)					0	192	105	180	Cont	Cont
MITRE/Aerospace TEMS					1009	903	452	899	Cont	Cont
<u>Test and Evaluation Organizations</u>										
Not Applicable										
(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)										
Government Furnished Property: Not Applicable										
Subtotal Product Development						3,186	6,804	8,699	Cont.	Cont.
Subtotal Support and Management						1,615	1,607	1,950	Cont.	Cont.
Subtotal Test and Evaluation						0	0	0	Cont.	Cont.

DATE **February 1998**

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0305111F Weather Service

Total Project	4,801	8,411	10,649	Cont.	Cont.
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	7,337	5,928	4,729	6,989	5,580	5,636	5,752	Continuing	TBD
2026 System Support	374	70	273	246	259	244	253	Continuing	TBD
3587 Precision Landing Development	6,963	5,858	4,456	6,743	5,321	5,392	5,499	Continuing	TBD
Quantity of RDT&E Articles	10/200	0	0	0	0	0	0	0	10/200

(U) A. Mission Description and Budget Item Justification

This effort was originally established for development of Military Microwave Landing System Avionics (MMLSA) and acquisition of the commercially developed Commercial Microwave Landing System Avionics (CMLSA). It was part of a twenty-year program to transition Air Force operations from the use of Precision Approach Radar (PAR) and Instrument Landing System (ILS) to the Microwave Landing System (MLS) for precision approach and landing. With termination of the MLS as the national precision landing standard, the effort is now being redirected to develop a replacement box for ILS avionics to sustain precision landing capability until the follow-on capability is chosen. The current Air Force ILS receivers do not meet the new specification required by the International Civil Aviation Organization (ICAO) for protection from interference problems forecast to occur after 1998. This program will accomplish an Analysis of Alternatives (AOA) for the Joint Precision Approach and Landing System (JPALS) program which will result in identification of the follow-on to the ILS and PAR systems. This program will also fund continuing studies to obtain an autonomous precision landing capability, and air traffic control studies under Global Access, Navigation, and Safety (GANS) efforts. Project 2026 funds ongoing liaison and interagency cooperative studies, between the USAF Air Traffic Control (ATC) and Landing Systems (ATCALs) program office and various organizations to include other Services, the Federal Aviation Administration (FAA) and ICAO. This program is in budget activity 7 - Operational System Development, because it upgrades avionics in currently fielded weapon systems.

(U) Acquisition Strategy: Engineering Manufacturing Development, Fixed Price Incentive Fee (FPIF), No Non-Developmental Items (NDI)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	7,643	6,571	925	TBD
(U) Appropriated Value	3,870	13,471		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-129	-536		
b. SBIR	-97	-332		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	3,706			
e. Recissions	-13			
f. Other		-6,675		
(U) Adjustments to Budget Years Since FY 1997 PB			3,804	
(U) Current Budget Submit/FY 1999 President's Budget	7,337	5,928	4,729	TBD

(U) Change Summary Explanation:

Funding: FY97 reprogramming includes a \$3,900 increase for additional Precision Landing System development in support of the C-17 Combat Mission Need Statement and a \$293 decrease to pay FY1988 cancelled bills for this program element. \$6.675M in FY98 is pending reprogramming to Other Procurement for air traffic control simulators. Funding increase of \$3.8M in FY99 is for air traffic control projects under Global, Access, Navigation, and Safety efforts.

Schedule: N/A

Technical: N/A

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Aircraft Procurement AF Budget Activity 5, Weapon System Code 3587	147	148						cont	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)										DATE February 1998																																																																																																									
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)																																																																																																														
<p>(U) D. <u>Schedule Profile</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;"></th> <th colspan="4" style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th colspan="4" style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th colspan="4" style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> </tr> <tr> <th style="text-align: left;"></th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> </tr> </thead> <tbody> <tr> <td>(U) Acquisition Milestones:</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>(U) Contract Milestones:</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>(U) Initial Tower Restoral Vehicle (TRV) Delivery</td> <td></td><td></td><td></td><td></td> <td style="text-align: center;">X</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td>(U) Test and Evaluation Milestones:</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td style="padding-left: 20px;">TRV First Article Complete</td> <td></td><td></td><td style="text-align: center;">X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td style="padding-left: 20px;">TRV Operational Testing</td> <td></td><td></td><td></td><td></td> <td style="text-align: center;">X</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </tbody> </table>													<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>					1	2	3	4	1	2	3	4	1	2	3	4	(U) Acquisition Milestones:													(U) Contract Milestones:													(U) Initial Tower Restoral Vehicle (TRV) Delivery					X								(U) Test and Evaluation Milestones:													TRV First Article Complete			X										TRV Operational Testing					X							
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>																																																																																																										
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)				PROJECT 2026		
<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost	
2026 System Support	374	70	273	246	259	244	253	Continuing	TBD	
Quantity of RDT&E Articles	0	0	0	0	0	0	0	Continuing	TBD	
<p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>This continuing effort funds ongoing liaison and interagency cooperative studies, as well as interoperability analyses between the USAF Air Traffic Control and Landing Systems (ATCALs) program office and various organizations which include the other services, the Federal Aviation Administration (FAA), and the International Civil Aviation Organization (ICAO). Continues mission support for the ATCALs programs including several joint efforts with the FAA. RDT&E funds are used to resolve or minimize technical interface problems associated with interoperability between existing or planned DoD/FAA ATCALs equipment and capabilities.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 67 Provided support for all ATCALs projects - (U) \$181 Continued interoperability and interface evaluations - (U) \$126 Provided support for the portable precision landing system studies for the Joint Special Operations Command (JSOC) - (U) \$374 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 10 Support for all ATCALs projects - (U) \$ 50 Conduct interoperability and interface evaluations - (U) \$ 10 Support for the precision landing system studies for the Joint Special Operations Command (JSOC) - (U) \$ 70 Total 										
Project 2026			Page 4 of 13 Pages				Exhibit R-2 (PE 0305114F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																												
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)	PROJECT 2026																																																												
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 95 Support for all Air Traffic Control and Landing Systems (ATCALs) projects - (U) \$120 Conduct interoperability and interface evaluations - (U) \$ 58 Support for the precision landing system studies for the Joint Special Operations Command (JSOC) - (U) \$273 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">374</td> <td style="text-align: center;">267</td> <td style="text-align: center;">279</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">423</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Reductions</td> <td style="text-align: center;">-49</td> <td style="text-align: center;">-244</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td></td> <td style="text-align: center;">-178</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Recissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> f. Other (BRS Adjustment)</td> <td></td> <td style="text-align: center;">-6,675</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-6</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">374</td> <td style="text-align: center;">70</td> <td style="text-align: center;">273</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: Programmatic adjustments</p> <p style="padding-left: 20px;">Schedule: N/A</p> <p style="padding-left: 20px;">Technical: N/A</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	374	267	279	Continuing	(U) Appropriated Value	423				(U) Adjustments to Appropriated Value					a. Cong Reductions	-49	-244			b. SBIR		-178			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Recissions					f. Other (BRS Adjustment)		-6,675			(U) Adjustments to Budget Years Since FY 1998 PB			-6		(U) Current Budget Submit/FY 1999 President's Budget	374	70	273	Continuing
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																										
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<p>Project 2026 Page 5 of 13 Pages Exhibit R-2 (PE 0305114F)</p>																																																														

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)			PROJECT 2026					
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>												
None.												
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Acquisition Milestones N/A												
(U) Contract Milestone												
(U) Initial Tower Restoral Vehicle (TRV) Delivery					X							
(U) Test and Evaluation Milestones												
(U) Operational Testing Complete			X									
(U) First Article Testing Complete					X							
(U) Conduct Precision Landing Studies									X			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)			PROJECT 2026		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) System Engineering					80	40	151			
(U) Contract Engineering					129	20	100			
(U) Test and Evaluation Support					120	0	0			
(U) Program Management Support					20	5	12			
(U) Travel					25	5	10			
(U) Total					374	70	273			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations: AFMC, ESC, Hanscom AFB, MA manages the overall ATCALs effort. MITRE Corporation, Bedford, MA, provides technical engineering support										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations:</u>										
None					0					
<u>Support and Management Organizations</u>										
Various	Multiple	Multiple	N/A		948	374	70	273	TBD	TBD
<u>Test and Evaluation Organizations</u>										
N/A:	N/A	N/A	0	0	0	0	0	0	0	0
Project 2026					Page 7 of 13 Pages			Exhibit R-3 (PE 0305114F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE					PROJECT			
7 - Operational System Development	0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)					2026			
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>									
Government Furnished Property:									
Item <u>Description</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Delivery <u>Date</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Product Development Property</u> N/A									
<u>Support and Management Property</u> N/A									
<u>Test and Evaluation Property</u> N/A									
Subtotal Product Development				0	0	0	0	0	
Subtotal Support and Management				948	374	70	273	TBD	
Subtotal Test and Evaluation				0	0	0	0	0	
Total Project				948	374	70	273	TBD	
Project 2026									
Page 8 of 13 Pages									
Exhibit R-3 (PE 0305114F)									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)				PROJECT 3587		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3587 Precision Landing Development		6,963	5,858	4,456	6,743	5,321	5,392	5,499	Continuing	TBD
Quantity of RDT&E Articles		10/200	0	0	0	0	0	0	0	10/200

(U) A. Mission Description and Budget Item Justification

DoD and the Department of Transportation (DOT) have a goal to develop and acquire a common civil/military precision approach and landing system that is capable of operating with Category I, II, or III signal guidance accuracy. The International Civil Aviation Organization (ICAO) and NATO designated worldwide implementation for PLS for January 1998 with Microwave Landing System (MLS) as the standard. Due to the emergence of the Global Positioning System (GPS), as a more cost effective solution, the Air Force's precision landing development has been redirected to develop a replacement box for the Instrument Landing System (ILS) to support a precision landing capability until GPS becomes available. The replacement box capability will allow DoD to meet the ICAO requirements for FM frequency protection. This is especially critical in Europe where there is a high density of FM radio stations. The Air Force has worldwide deployment commitments and large numbers of aircraft must comply with the ICAO Standards and recommended practices. In FY97, the Air Force began a new effort to install the precision landing system receiver on its C-17 aircraft to solve short-term operational deficiencies. FY96/97 funding also accomplished an Analysis of Alternatives (AOA) for the Joint Precision Approach and Landing System (JPALS) program. The primary objective of the AOA is to conduct a comprehensive evaluation of precision landing alternatives in the context of relevant scenarios and user requirements, and to recommend a preferred solution(s) to replace ILS and precision approach radar systems.

(U) FY 1997 (\$ in Thousands):

- (U) \$2,513 Began development of a precision landing capability to include Differential GPS
- (U) \$451 Performed platform integration and system engineering analyses
- (U) \$3,999 Began work on Air Mobility Command (AMC) Precision Approach Capability (PAC) (includes cost of RDT&E articles)
- (U) \$6,963 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)	PROJECT 3587																																																							
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$865 Continue development of a precision landing capability to include Differential GPS - (U) \$113 Perform platform integration and system engineering analyses - (U) \$208 Begin Precision Landing System (PLS) flight certification - (U) \$4,672 Joint Precision Approach and Landing System (JPALS) - (U) \$5,858 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$105 Continue to perform platform integration and system engineering analyses - (U) \$451 Continue PLS flight certification - (U) \$3,900 Begin air traffic control work under Global Access, Navigation, and Safety (GANS) effort - (U) \$4,456 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">7,269</td> <td style="text-align: center;">6,304</td> <td style="text-align: center;">646</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">3,447</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional Reduction</td> <td style="text-align: center;">-80</td> <td style="text-align: center;">-292</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: center;">-97</td> <td style="text-align: center;">-154</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. BTRs</td> <td style="text-align: center;">3705</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Recissions</td> <td style="text-align: center;">-13</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">3,810</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">6,963</td> <td style="text-align: center;">5,858</td> <td style="text-align: center;">4,456</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	7,269	6,304	646	TBD	(U) Appropriated Value	3,447				(U) Adjustments to Appropriated Value					a. Congressional Reduction	-80	-292			b. SBIR	-97	-154			c. Omnibus or Other Above Threshold Reprogram					d. BTRs	3705				e. Recissions	-13				(U) Adjustments to Budget Years Since FY 1998 PB			3,810		(U) Current Budget Submit/FY 1999 President's Budget	6,963	5,858	4,456	TBD
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<p>(U) Change Summary Explanation: Funding: Funding: FY97 reprogramming includes a \$3,900 increase to support additional Precision Landing System development in support of the C-17 Combat Mission Need Statement and a \$293 decrease to pay FY1988 cancelled bills for this program element. Funding increase of \$3.8M in FY99 is for air traffic control related projects under Global Access, Navigation, and Safety (GANS).</p> <p>Schedule: N/A</p> <p>Technical: N/A</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>FY 2000</u></th> <th style="text-align: center;"><u>FY 2001</u></th> <th style="text-align: center;"><u>FY 2002</u></th> <th style="text-align: center;"><u>FY 2003</u></th> <th style="text-align: center;"><u>To Compl cont</u></th> <th style="text-align: center;"><u>Total Cost TBD</u></th> </tr> </thead> <tbody> <tr> <td>(U) Aircraft Procurement AF Budget Activity 5, Weapon System Code 3587</td> <td style="text-align: center;">147</td> <td style="text-align: center;">148</td> <td style="text-align: center;">0</td> <td></td> <td></td> </tr> </tbody> </table> <p>(U) D. <u>Schedule Profile</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> </tr> </thead> <tbody> <tr> <td>(U) Acquisition Milestones:</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2 3 4</td> <td style="text-align: center;">1 2 3 4</td> </tr> <tr> <td>(U) Contract Milestones</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Contract Award (GCA-2000)</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td>(U) Delivery of 1st System</td> <td></td> <td></td> <td style="text-align: center;">X</td> </tr> <tr> <td>(U) C-17 Precision Landing System Receiver Contract Modification</td> <td style="text-align: center;">X</td> <td></td> <td></td> </tr> <tr> <td>(U) Test and Evaluation Milestones M/A</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>									<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl cont</u>	<u>Total Cost TBD</u>	(U) Aircraft Procurement AF Budget Activity 5, Weapon System Code 3587	147	148	0	0	0	0	0				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	(U) Acquisition Milestones:	1	2 3 4	1 2 3 4	(U) Contract Milestones				(U) Contract Award (GCA-2000)		X		(U) Delivery of 1 st System			X	(U) C-17 Precision Landing System Receiver Contract Modification	X			(U) Test and Evaluation Milestones M/A			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl cont</u>	<u>Total Cost TBD</u>																																														
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Project 3587		Page 11 of 13 Pages			Exhibit R-2 (PE 0305114F)																																																		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)			PROJECT 3587		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Primary Hardware Development				2,513	865	269			
(U)	Test and Evaluation Support					95	85			
(U)	Engineering/Technical Support				202	190	170			
(U)	Avionics Integration Efforts				149					
(U)	Program Management Support				70	20	20			
(U)	Analysis of Alternatives (JPALS)					4,672				
(U)	AMC PAC				3,999					
(U)	ATC Related GANS Programs						3,900			
(U)	Travel				30	16	12			
(U)	Total				6,963	5,858	4,456			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
GEC Marconi-Hazeltine	FPIF	Jun 93	19,400	19,400	9,300	5,300	865	500	Continue	TBD
<u>Support and Management Organizations</u>										
Various	Multiple	Multiple	N/A	N/A		1,521	4,993	4,046	Continue	TBD
<u>Test and Evaluation Organizations</u>										
Project 3587					Page 12 of 13 Pages			Exhibit R-3 (PE 0305114F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305114F Air Traffic Cntrl/Approach/Landing Sys (ATCALs)				PROJECT 3587	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
FAA Test Center	MIPR	May 97			0	142	0	0	0	142
(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)										
Government Furnished Property:										
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date		Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Property:</u> N/A										
<u>Support and Management Property:</u> N/A										
<u>Test and Evaluation Property:</u> N/A										
Subtotal Product Development					9,300	5,300	865	500	Continue	
Subtotal Support and Management						1,521	993	3,956	Continue	
Subtotal Test and Evaluation						142	0	0		
Total Project					9,300	6,963	5,858	4,456	Continue	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305119F Medium Launch Vehicles (Space)	PROJECT 624A
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
624A Medium Launch Vehicle	10,999	5,130	7,375	8,009	7,992	5,374	2,040	0	430,139
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

National Security requirements dictate a continuing, highly reliable means of placing critical Department of Defense (DoD) satellites into required orbits. Assured access to space, directed by the President in the National Security Launch Strategy, will be accomplished through the use of a robust mix of Expendable Launch Vehicles (ELVs). The Medium Launch Vehicle (MLV) program provides sustainment, procurement and launch of DoD ELVs, including Atlas II and Delta II at Cape Canaveral AS, FL and at Vandenberg AFB, CA. The MLV launches the Defense Satellite Communication System (DSCS) and the Global Positioning System (GPS) satellites. The RDT&E budget for MLV primarily consists of engineering support for system performance upgrades to both the vehicles and the launch facilities, new payload integration, sustaining engineering, and post-flight assessment to maintain the high reliability of the launch vehicles. In addition, testing associated with the 17 Jan 97 mishap of a Delta II booster is included. This program is in Budget Activity 7, Operational Systems Development, because the Medium Launch Vehicles program is in full production and fully operational.

B. Acquisition Strategy:

The MLV program is in final production and consists of two distinct medium launch vehicles: Atlas IIA and the Delta II. Funding for the production of the Atlas Air Force program has been completed, and the remaining Air Force requirements are primarily for the remaining DSCS mission's launch services on the Lockheed Martin Atlas production contract. The Delta II program primarily consists of launching replenishment satellites for the Global Positioning System (GPS). Final production procurement is planned for FY99, with advance procurement in FY98, on the existing Boeing production contract. The MLV program is scheduled to start transitioning to EELV beginning with FY02 launches.

(U) FY 1997: (\$in thousands)

- (U) \$ 4,673 Base support and environmental programs
- (U) \$ 960 West Coast Atlas II activation
- (U) \$ 0 DSCS integration
- (U) \$ 2,796 Delta II range facilities upgrades
- (U) \$ 2,570 Sustaining engineering and mission support for MLV launch facilities, infrastructure, and launch operations for launch complexes 3, 17, and 36
- (U) \$10,999 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE		
BUDGET ACTIVITY		PROJECT		
7 - Operational System Development		0305119F Medium Launch Vehicles (Space)		
		624A		
(U) <u>FY 1998</u> : (\$ in thousands)				
- (U) \$ 0 West Coast Atlas II activation continues				
- (U) \$ 300 DSCS integration				
- (U) \$ 844 Delta II range required facilities upgrade				
- (U) \$ 632 Delta II systems integration				
- (U) \$ 3,354 Sustaining engineering and mission support for MLV launch facilities, infrastructure, and launch operations for launch complexes 3, 17, and 36				
- (U) \$ 5,130 Total				
(U) <u>FY 1999</u> : (\$ in thousands)				
- (U) \$ 0 West Coast Atlas II activation continues				
- (U) \$ 300 DSCS integration				
- (U) \$ 500 Delta II range required facilities upgrade				
- (U) \$ 0 Delta II systems integration				
- (U) \$ 6,575 Sustaining engineering and mission support for MLV launch facilities, infrastructure, and launch operations for launch complexes 3, 17, and 36				
- (U) \$ 7,375 Total				
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total
(U) Previous President's Budget (FY1998 PB)	12,720	5,719	14,623	445,215
(U) Appropriated Value	13,368	5,719		
(U) Adjustments to Appropriated Value				
a. Congressional Gen Reductions	-347	-478		
b. SBIR	-301	-111		
c. Omnibus or Other Above Threshold Reprogram	-1700			
d. Below Threshold Reprogramming				
e. Rescissions	-21			
(U) Adjustments to Budget Years Since FY 1998 PB			-7,248	
(U) Current Budget Submit/FY1999 President's Budget	10,999	5,130	7,375	430,139
Project 624A	Page 2 of 5 Pages	Exhibit R-2 (PE 0305119F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998																																																																																																				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305119F Medium Launch Vehicles (Space)				PROJECT 624A																																																																																																			
<p>(U) Change Summary Explanation: Funding: FY 1999 adjustments reflect reduction of funds for Atlas/DSCS integration as DSCS Service Life Extension Program satellites will remain within weight limits. Schedule: Not Applicable Technical: Not Applicable</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>FY 2000</u></th> <th style="text-align: center;"><u>FY 2001</u></th> <th style="text-align: center;"><u>FY 2002</u></th> <th style="text-align: center;"><u>FY 2003</u></th> <th style="text-align: center;"><u>To Complete</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Missile Procurement, Air Force (PE35119F) (BA45, P-25/26)</td> <td style="text-align: right;">154,651</td> <td style="text-align: right;">201,799</td> <td style="text-align: right;">188,406</td> <td style="text-align: right;">72,742</td> <td style="text-align: right;">55,741</td> <td style="text-align: right;">36,921</td> <td style="text-align: right;">10,794</td> <td style="text-align: right;">0</td> <td style="text-align: right;">2,620,893</td> </tr> </tbody> </table> <p><u>Related RDT&E: None</u></p> <p>(U) D. <u>Schedule Profile</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;"></th> <th colspan="3" style="text-align: center;"><u>FY 1997</u></th> <th colspan="3" style="text-align: center;"><u>FY 1998</u></th> <th colspan="3" style="text-align: center;"><u>FY 1999</u></th> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> </tr> </thead> <tbody> <tr> <td>(U) Delta/GPS Launches</td> <td></td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td style="text-align: center;">XX</td> <td></td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td style="text-align: center;">XX</td> </tr> <tr> <td>(U) Delta/STP Launches</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Atlas/DSCS Launches</td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> </tr> <tr> <td>(U) Atlas West Coast Pad Activation</td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>	(U) Missile Procurement, Air Force (PE35119F) (BA45, P-25/26)	154,651	201,799	188,406	72,742	55,741	36,921	10,794	0	2,620,893		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				1	2	3	4	1	2	3	4	1	2	3	4	(U) Delta/GPS Launches		X	X		X				XX		X	X	XX	(U) Delta/STP Launches									X					(U) Atlas/DSCS Launches					X								X	(U) Atlas West Coast Pad Activation				X									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>																																																																																																		
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	1	2	3	4	1	2	3	4	1	2	3	4																																																																																															
(U) Delta/GPS Launches		X	X		X				XX		X	X	XX																																																																																														
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Project 624A			Page 3 of 5 Pages			Exhibit R-2 (PE 0305119F)																																																																																																					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305119F Medium Launch Vehicles (Space)				PROJECT 624A		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U)	Base Support and Environmental programs			4,673	0	0				
(U)	West Coast Atlas II Activation			960	0	0				
(U)	DSCS Integration			0	300	300				
(U)	Delta II Range Facilities Upgrades			2,796	844	500				
(U)	Delta II Systems Integration			0	632	0				
(U)	Sustaining Engineering and Mission Support			<u>2,570</u>	<u>3,354</u>	<u>6,575</u>				
(U)	Total			10,999	5,130	7,375				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation Date	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Product Development Organizations</u>										
Lockheed Martin	SS/FFP	Jun 88	N/A	N/A	70,927	0	300	300	300	71,827
Boeing	SS/FFP	Sep 87	N/A	N/A	205,270	0	0	0	0	205,270
Boeing	C/FFP	Apr 93	N/A	N/A	19,873	3,962	4,217	1,700	4,200	33,952
GSAC	Various	Various	N/A	N/A	3,321	0	0	0	0	3,321
Austere Improvements	Various	Various			10,484	0	0	0	0	10,484
<u>Support and Management Organizations</u>										
Mission Support	FPI	FY94	N/A	N/A	15,494	5,317	613	5,375	18,915	45,714
Various SMC	Various	FY94	N/A	N/A	49,252	642	0	0	0	49,894
Project 624A				Page 4 of 5 Pages				Exhibit R-3 (PE 0305119F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305119F Medium Launch Vehicles (Space)					PROJECT 624A	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program	
Other Ktr Sup	FFP	FY94	N/A	N/A	563	118	0	0	0	681	
Vandenberg Sup Environment/Safety	Various	Various	N/A	N/A	2,430	960	0	0	0	3,390	
	Various	Various	N/A	N/A	5,606	0	0	0	0	5,606	
<u>Test and Evaluation Organizations</u>											
Not Applicable											
Government Furnished Property: Not Applicable											
Subtotal Product Development					309,875	3,962	4,517	2,000	4,500	324,854	
Subtotal Support and Management					73,345	7,037	613	5,375	18,915	105,285	
Subtotal Test and Evaluation					0	0	0	0	0	0	
Total Project					383,220	10,999	5,130	7,375	23,415	430,139	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305128F Security and Investigative Activities (S&IA)				PROJECT 1931	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1931 TECH SURVEIL COUNTER MEAS EQPT	275	3,325*	458	474	480	483	487	0	TBD
Quantity of RDT&E Articles	1	0	2	1	1	1	1		

* Cost of test articles embedded in overall project cost; breakout not available. FY98 amount is pending reclassification of funds to PE 33140F.

(U) A. Mission Description and Budget Item Justification
 This program funds 70% of the Air Force Office of Special Investigations' (AFOSI) manpower and operations and maintenance costs, as well as 100% of its procurement and research and development costs. AFOSI conducts specialized investigative activities and force protection support for Air Force (AF) commanders worldwide. This assists AF commanders in protecting their people and resources. AFOSI's mission includes investigating criminal matters affecting AF personnel, contract fraud and economic crimes involving AF weapons systems and spare parts, the investigation of environmental crime, counterdrugs, computer intrusion detection and forensic media analysis of computer crimes. This element supports Technical Surveillance Countermeasures (TSCM), Computer Crime Investigations (CCI), and technical support to criminal and counterintelligence investigations and operations conducted by AFOSI. AFOSI's TSCM mission provides security assessments to both AF and DoD facilities and programs. The purpose of CCI research is to improve AF and DoD Information Operations capability by enhancing AFOSI's ability to deter or prevent spies, hackers, or saboteurs from manipulating, damaging, or stealing sensitive war fighting data or systems. Failing that, to investigate, identify, and prosecute those who do. While most research to meet operational requirements is Operational System Development, there is also research in the category of Engineering and Manufacturing Development due to a need for modifications to present technology.

The equipment required to provide technical support to investigations is unique and complex. This equipment must be continually updated to provide state-of-the-art capabilities to detect and neutralize criminal activities targeted against the AF and DoD. In an era of advancing technology, reduced manning, and increasingly high level fraud, environmental crime and computer crime investigations, technical investigative equipment must be continuously updated to enable AFOSI special agents to have the most cost effective and best possible means of thwarting criminal acts. The evolution of a new wave of computer crimes has made AFOSI responsible for the collection, investigative analysis, national level law enforcement coordination, and dissemination of hacker activity and intrusion incidents for the Air Force. AFOSI's computer crime equipment must stay on the leading edge of technology to collect criminal information as well as pursue and apprehend criminals through a global medium. There were 2800 computer security violations and/or intrusion incidents reported to AFOSI in 1996. AFOSI must continually update its existing high tech computer surveillance equipment to support ongoing and future investigative operations to identify hackers and hacker groups, as well as potential hostile government activities targeting Air Force communication and control systems. This program is in Budget Activity 7, Operational System Development, because its products are primarily for use in investigative activity of an operational nature.

(U) Acquisition Strategy:
 All major contracts within this Program Element were awarded via sole source contract due to the sensitivity of technologies involved.

Project 1931 Page 1 of 6 Pages Exhibit R-2 (PE 0305128F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305128F Security and Investigative Activities (S&IA)	PROJECT 1931
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$164 TSCM Receiver/Software Suite. Demonstration of TSCM Receiver Suite - (U) \$100 TSCM Receiver/Software Suite. Validation of TSCM Receiver Suite - (U) \$ 11 Telephone/Computer Local Area Network (LAN) Analyzer. Demonstration and validation of countermeasure units for field applications - (U) \$275 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 480 Telephone/Computer LAN Analyzer. Demonstration and validation of upgraded software - (U) \$ 500 Computer Crimes Investigative (CCI) Equipment. RDT&E of CCI software - (U) \$ 461 Linux Media Analysis Platform. RDT&E of Linux Media Analysis Platform - (U) \$1,884 Reclassification to PE 33140F (Pending) - (U) \$3,325 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$250 Telephone/Computer LAN Analyzer. Demonstration and validation of upgraded software - (U) \$ 67 Computer Crimes Investigative (CCI) Equipment. RDT&E of CCI software - (U) \$141 Ground Penetrating Radar/Millimeter Wave Equipment. Demonstration and validation of millimeter wave technology - (U) \$458 Total 		
Project 1931	Page 2 of 6 Pages	Exhibit R-2 (PE 0305128F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305128F Security and Investigative Activities (S&IA)	PROJECT 1931

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>
Automatic Data Processing Equipment	190	95	91	0	0	191	191	TBD	TBD
Radio Equipment	421	0	0	0	0	0	0	0	421
Base Communication Infrastructure	0	414	0	0	0	0	0	0	414
Base Procured Equipment	100	0	0	0	0	0	0	0	100
Technical Surveillance Countermeasures Equipment	1060	1952	2035	3020	3049	2876	2877	TBD	TBD
BA63/Security & Investigative Activities/PE0305128F									

(U) D. Schedule Profile

		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2	3	4
(U) TSCM Receiver/Software Suite	X	X	X									
(U) Telephone/Computer LAN Analyzer	X											
(U) CCI Equipment					X							
(U) Linux Media Analysis Platform					X	X						
(U) Millimeter Wave Equipment								X		X		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305128F Security and Investigative Activities (S&IA)				PROJECT 1931	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Primary Hardware Development					204	211	204			
(U) Software Development					71	1,230	254			
(U) Reclassification to PE 33140F					0	1,884	0			
(U) Total					275	3,325	458			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Matrix Engineering	SS/FFP	Feb 97	N/A	N/A	130	264	0	0	0	394
S.T. Research Corp.	SS/FFP	Mar 97	N/A	N/A	152	11	480	250	TBD	893
TBD	SS/FFP	Mar 98	N/A	N/A	0	0	500	67	TBD	567
TBD	SS/FFP	Mar 98	N/A	N/A	0	0	461	0	0	461
TBD	SS/FFP	Mar 99	N/A	N/A	0	0	0	141	0	141
<u>Support and Management Organizations:</u>										
None										
<u>Test and Evaluation Organizations:</u>										
None										
Project 1931					Page 5 of 6 Pages			Exhibit R-3 (PE 0305128F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305128F Security and Investigative Activities (S&IA)			PROJECT 1931		
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Government Furnished Property:</u> None										
<u>Product Development Property:</u> None										
<u>Support and Management Property:</u> None										
<u>Test and Evaluation Property:</u> None										
Subtotal Product Development					282	275	1,441	458	TBD	TBD
Subtotal Support and Management					0	0	0	0	0	0
Subtotal Test and Evaluation					0	0	0	0	0	0
Reclassification to PE 33140F (Pending)							1,884			
Total Project					282	275	3,325	458	TBD	TBD
<p><i>* Due to the small size and narrow scope of these efforts there are no funds expended for Support Cost and Management Services. Similarly, Test and Evaluation costs are embedded in Product Development.</i></p>										

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305137F National Airspace System				PROJECT 4090		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4090	National Airspace System (NAS)	11,818	11,917	1,881	288	205	207	211	436	108,798
	Quantity of RDT&E Articles	4/*	2/**	0	0	0	0	0	0	0

(U) **Note:** * Cost of RDT&E articles (\$3.4 Million in FY97) includes three (3) voice switch configurations and one (1) automation subsystem to support developmental/operational testing.
 ** Cost of RDT&E articles (\$3.0 Million in FY98) includes two (2) automation subsystems to support developmental/operational testing.

(U) **A. Mission Description and Budget Item Justification:**
 The DoD National Airspace System program will modernize the DoD Air Traffic Control (ATC) system in parallel with the Federal Aviation Administration (FAA) modernization. DoD will acquire, to the maximum extent practical, systems on contract with the FAA to reduce development costs and prevent duplication. The DoD NAS program provides systems and facilities compatible/interoperable with the FAA modernization, prevents DoD flight delays and cancellations, continues DoD's access into Special Use Airspace (SUA), provides transparent services to military and civil aircraft, replaces aging DoD ATC systems, and increases flight safety. The Military Airspace Management System (MAMS) will effectively schedule and manage SUA. DoD military ATC and fighting/flying readiness will be maintained. This program is in budget activity 7 - Operational System Development, because the DoD Air Traffic Control system is operational.

(U) **Acquisition Strategy:**
 All major contracts were awarded after full and open competition. Adjustments to funding of specific activities reflect realignment of development/test activities with the revised (27 Feb 97) Acquisition Program Baseline (APB) and amended (30 Jun 97) Acquisition Decision Memorandum (ADM).

(U) **FY 1997 (\$ in Thousands):**

- (U) 1,805 Continued Military Airspace Management System (MAMS) development
- (U) 1,318 Continued site surveys, facility/transition planning
- (U) 325 Continued NAS DoD subsystem analysis for each DoD site
- (U) 3,280 Continued radar acquisition and test
- (U) 3,290 Continued automation acquisition and test
- (U) 1,800 Continued voice switch acquisition and test
- (U) \$11,818 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305137F National Airspace System	PROJECT 4090
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(U) FY 1998 (\$ in Thousands):

- (U) 4,400 Complete Military Airspace Management System (MAMS) development
- (U) 137 Complete facility/transition planning and continue site surveys
- (U) 455 Continue NAS DoD subsystem analysis for each DoD site
- (U) 2,535 Continue radar acquisition and test
- (U) 4,190 Continue automation acquisition and test
- (U) 200 Complete voice switch acquisition and test
- (U) \$11,917 Total

(U) FY 1999 (\$ in Thousands):

- (U) 316 Continue site surveys
- (U) 600 Complete NAS DoD subsystem analysis for each DoD site
- (U) 965 Complete radar and automation acquisition and test
- (U) \$1,881 Total

(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	11,858	12,830	1,919	108,798
(U) Appropriated Value	12,614	12,830		
(U) Adjustments to Appropriated Value				
a. Congressional General Reductions	-477	-687		
b. SBIR	-279	-226		
c. Omnibus & Other Above Threshold Reprogramming				
d. Below Threshold Reprogramming	-20			
e. Rescissions	-20			
(U) Adjustments to Budget Year Since FY 1998 PB			-38	
(U) Current Budget Submit/1999 President's Budget	11,818	11,917	1,881	108,798

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305137F National Airspace System	PROJECT 4090
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(U) Change Summary Explanation:

Funding: Changes reflected in the table above.

Schedule: Adjustments of specific activities reflect realignment of development/test activities with the revised (27 Feb 97) Acquisition Program Baseline (APB) and amended (30 Jun 97) Acquisition Decision Memorandum (ADM).

Technical: No Change.

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement, BA 16 Weapon system code 833020, PE0305137F	0	16,192	45,308	50,519	51,529	57,526	46,508	Cont	TBD
(U) Other Procurement, BA16 Weapon system code 86190A, PE0305137F, (Initial Spares)	0	1,009	5,639	6,973	8,067	9,190	6,472	Cont	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305137F National Airspace System						PROJECT 4090		
(U) D. <u>Schedule Profile</u>													
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4	
(U) Acquisition Milestones													
(U) Milestone II (MS II) (Jul 95)													
(U) Revised Acquisition Program Baseline		X											
(U) Amended MS II Acquisition Decision Memo			X										
(U) Radar & Automation LRIP Decision									X				
(U) Voice Switch Procurement Decision								X					
(U) Radar & Automation Milestone III											X		
(U) Contract Milestones													
(U) Radar													
Contract Award (Aug 96)													
Complete radar IOT&E										X			
(U) Automation													
Contract Award (Sep 96)													
Complete automation IOT&E										X			
(U) Voice Switch													
Contract Award (Jul 95)													
Complete voice switch IOT&E								X					
(U) NAS IOC Apr 2000													
(U) NAS FOC Apr 2006													
(U) MAMS													
Contract Award (Nov 95)													
Began Initial Usability Assessment				X									
MAMS IOC								X					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305137F National Airspace System	PROJECT 4090
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
Software Development	1,805	4,400	0
Site Surveys	290	100	100
Facility/Transition Planning	290	37	0
Integration/Interface Planning	50	50	0
System Engineering	682	340	551
Primary Hardware Test and Evaluation	8,370	6,725	965
Program Management Support	281	215	215
Travel	50	50	50
Total	11,818	11,917	1,881

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Product Development Organizations

a. Computer Based Systems	CPAF	Jun 94	3,500	3,500	3,500	0	0	0	0	3,500
b. Hughes Aircraft	CPFF	Nov 95	12,705	12,705	6,500	1,805	4,400	0	0	12,705
c. Raytheon (Radar)	IDIQ - FFP	Aug 96	18,356	18,356	16,449	967	940	0	0	18,356
d. Raytheon (Automation)	IDIQ-FFP	Sep 96	5,862	5,862	0	2,292	3,005	565	0	5,862
e. Denro	IDIQ-FFP	Jul 95	2,570	2,570	1,462	1,108	0	0	0	2,570

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305137F National Airspace System				PROJECT 4090	
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Support and Management Organizations</u>										
MITRE	CPAF	Oct 94	21,910	21,910	17,300	2,900	1,210	500	0	21,910
Martin Marietta	FFP	Sep 94	8,700	8,700	7,514	822	364	0	0	8,700
Miscellaneous	Multiple	Multiple	32,624	32,624	28,575	1,224	1,398	516	1,347	33,060
<u>Test and Evaluation Organization</u>										
46 th Test Wing, Eglin AFB, FL	PO	Multiple	2,135	2,135	535	700	600	300	0	2,135
Government Furnished Property: None										
Subtotal Product Development			42,993	42,993	27,911	6,172	8,345	565	0	42,993
Subtotal Support and Management			63,670	63,670	53,389	4,946	2,972	1,016	1,347	63,670
Subtotal Test and Evaluation			2,135	2,135	535	700	600	300	0	2,135
Total Project			108,798	108,798	81,835	11,818	11,917	1,881	1,347	108,798

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305138F Upper Stage Space Vehicles (Space)	PROJECT 4053
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4053 Upper Stage Space Vehicles	1,505	3,150	558	1,920	1,863	12	0	0	25,868
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

(U) The Upper Stages Program provides consolidated acquisition of the Inertial Upper Stage (IUS) to support the launch of Defense Support Program (DSP) satellites. IUS is an upper stage on the Titan IV (can be modified for Shuttle) and delivers the DSP satellite to the required orbit. The RDT&E program continuously evaluates and improves upper stage reliability, cost effectiveness, and responsiveness. It supports redesign of aging equipment and spares which are no longer manufactured or available; investigation of flight anomalies; and small studies to assist in defining future upper stages. This program is categorized in Budget Activity 7, Operational Systems Development, because the Inertial Upper Stage Program is in the production phase and is fully operational.

(U) **Acquisition Strategy:** Program is in final production under the fourth production contract. The components for the four remaining IUS units are procured and are in storage. The remaining procurement effort is for upper stage buildup, replacement parts, and component shelf life extension. Within the RDT&E budget for IUS, Avionics Obsolescence Activity (AOA) will replace obsolete, insupportable guidance, navigation and control system. The third part of the strategy involves the integration and launch services, flight operations, and post-flight analysis. The final portion of the strategy is the independent validation and verification of the IUS software.

(U) FY 1997: (\$ in thousands)

- (U) \$ 303 Study and design corrective actions for anomalies and obsolete items
- (U) \$ 0 Avionics Obsolescence Mitigation (approved by Congress for Omnibus source)
- (U) \$1,202 Program Management Support Activities
- (U) \$1,505 Total

(U) FY 1998: (\$ in thousands)

- (U) \$ 350 Study and design corrective actions for anomalies and obsolete items
- (U) \$ 0 Avionics Obsolescence Mitigation
- (U) \$ 0 Program Management Support Activities
- (U) \$ 2,800 Reprogrammed to higher Air Force priority (CSEL and GBS)
- (U) \$ 3,150 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305138F Upper Stage Space Vehicles (Space)	PROJECT 4053																																																							
<p>(U) <u>FY 1999: (\$ in thousands)</u></p> <ul style="list-style-type: none"> - (U) \$ 558 Study and design corrective actions for anomalies and obsolete items - (U) \$ 0 Avionics Obsolescence Mitigation - (U) \$ 0 Program Management Support Activities - (U) \$ 558 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total</u> <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998 PB)</td> <td style="text-align: right;">3,010</td> <td style="text-align: right;">3,337</td> <td style="text-align: right;">3,369</td> <td style="text-align: right;">36,304</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">3,154</td> <td style="text-align: right;">3,337</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Gen Reductions</td> <td style="text-align: right;">-70</td> <td style="text-align: right;">-117</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-74</td> <td style="text-align: right;">-70</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td style="text-align: right;">-1,000</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming (BTR)</td> <td style="text-align: right;">-500</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: right;">-5</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY98 PB</td> <td></td> <td style="text-align: right;">0</td> <td style="text-align: right;">-2,811</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY1999 President's Budget</td> <td style="text-align: right;">1,505</td> <td style="text-align: right;">*3,150</td> <td style="text-align: right;">558</td> <td style="text-align: right;">25,868</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: *FY 1998: \$1.0M has been below threshold reprogrammed to Combat Survivor Evader Locator (CSEL) program and \$1.8M is currently pending approval for above threshold reprogramming to Global Broadcasting System (GBS). FY 1999 reflects reductions to program management support and anomaly resolution because of high system performance and reliability.</p> <p style="padding-left: 40px;">Schedule: Not Applicable Technical: Not Applicable</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>	(U) Previous President's Budget (FY1998 PB)	3,010	3,337	3,369	36,304	(U) Appropriated Value	3,154	3,337			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions	-70	-117			b. SBIR	-74	-70			c. Omnibus or Other Above Threshold Reprogram	-1,000				d. Below Threshold Reprogramming (BTR)	-500				e. Rescissions	-5				(U) Adjustments to Budget Years Since FY98 PB		0	-2,811		(U) Current Budget Submit/FY1999 President's Budget	1,505	*3,150	558	25,868
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Project 4053	Page 2 of 5 Pages	Exhibit R-2 (PE 0305138F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305138F Upper Stage Space Vehicles (Space)	PROJECT 4053
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) Missile Procurement - (PE35138) (BA45, P-23)	17,088	47,042	48,012	46,827	44,393	28,008	0	0	231,370

Related RDT&E:
 (U) PE 0305144F, Titan Vehicles
 (U) PE 0102431F, Defense Support Program (DSP)
 (U) Inertial Upper Stage (IUS) program supports the NASA Space Transportation System as an upper stage used with the Space Shuttle

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) DoD Launches		X							X			
(U) Avionics Replacement*												
(U) Integration, Launch Support, and Life Extension Modification*												

* Activities are continuous throughout the year.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305138F Upper Stage Space Vehicles (Space)				PROJECT 4053	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Avionics Obsolescence Mitigation				0	0	0			
(U)	Program Management Support				1,202	0	0			
(U)	Systems Engineering				303	3,150	558			
(U)	Total				1,505	3,150	558			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Boeing	SS/FPI/AF	Jul 85	906,671*	942,335*	6,148	0	0	0	0	6,148
	SS/FPI/AF	Mar 91	151,189*	158,055*	1,991	259	0	0	0	2,250
	SS/CPAF/LOE	Sep 90	N/A	N/A	4,064	0	0	0	0	4,064
	SS/CPAF	Jun 97	N/A	N/A	N/A	44	3150	558	3795	7,547
United Tech Corp/Pratt & Whitney	SS/CPFF	Mar 95	N/A	N/A	855	0	0	0	0	855
*Amounts include funds used for IUS under previous Program Elements										
<u>Support and Management Organizations</u>										
Space and Missile Systems Center, LAAFB	N/A	N/A	N/A	N/A	3,802	1,202	0	0	0	5,004
Project 4053					Page 4 of 5 Pages			Exhibit R-3 (PE 0305138F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305138F Upper Stage Space Vehicles (Space)				PROJECT 4053	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Test and Evaluation Organizations</u> Not Applicable										
Government Furnished Property: Not Applicable										
					Total					
					<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development					13,058	303	3,150	558	3,795	20,864
Subtotal Support and Management					3,802	1,202	0	0	0	5,004
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					16,860	1,505	3,150	558	3,795	25,868

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305144F Titan Space Launch Vehicles (Space)			PROJECT 4135		
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4135 Titan II/IV	77,702	70,483	87,443	44,185	40,495	18,454	11,665	0	3,116,410
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

(U) National security requirements dictate a continuing, highly reliable means of placing critical DoD satellites into required orbits. The Titan IV program provides the capability to launch the largest of these satellites into near-earth or geosynchronous orbits from either the east or west coast launch facilities. Titan IV is used to launch Air Force, National Reconnaissance Office, and NASA payloads. This program provides several different configurations of the Titan IV [No Upper Stage (NUS), Inertial Upper Stage (IUS), and Centaur]. In addition, the Titan IV program has developed a new vehicle configuration, the Titan IVB, with solid rocket motor upgrade (SRMU), new avionics and ground support equipment to meet reliability and increased performance requirements. This program provides continuing integration support to the payload community as well as continuing engineering support to maintain system characterization and reliability.

(U) Since FY94, this program element also included funding for sustaining engineering, payload integration, and Government costs for the Titan II space launch vehicle. This PE is in Budget Activity 7, Operational Systems Development, because both Titan II and Titan IV are operational launch vehicles. Major Titan IV effort remaining is SRMU recertification. Major activity is static test firing of SRMU in 1QFY00. Remaining activity is maintain sustaining engineering and anomaly resolution capability through the end of the program.

(U) Acquisition Strategy:

(U) The program has implemented a revised acquisition strategy for the entire 40-vehicle program. During FY1996, Titan IV transitioned from the old 41-vehicle development/production and payload integration contracts to new contracts designed to improve cost accountability, correct contract discrepancies, and establish an overall programmatic view for the effort to complete the program. The new contracts combine Titan II and Titan IV production, storage, pad maintenance and deactivation, launch operations, anomaly resolution, development and hardware requalification, payload integration, and program studies to provide the greatest potential for cost savings by maximizing use of resources and eliminating duplicative processes.

(U) FY 1997 (\$ in Thousands):

- (U) \$52,797 Titan Hardware Redesign and Requal (Solid Rocket Motor Upgrade (SRMU) and hardware obsolescence)
- (U) Continued integration for the Defense Support Program (DSP) and Milstar

\$6,205

- (U) \$18,700 Continued Titan Booster Support

Project 4135 Page 1 of 5 Pages Exhibit R-2 (PE 0305144F)

DATE
February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0305144F Titan Space Launch Vehicles (Space)

(U) \$77,702 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305144F Titan Space Launch Vehicles (Space)	PROJECT 4135																																																							
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$55,886 Titan Hardware Redesign and Requal (Solid Rocket Motor Upgrade (SRMU) and hardware obsolescence) - (U) \$14,597 Continue integration for the DSP and Milstar - (U) \$70,483 Total <p style="margin-left: 40px;">(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$65,576 Titan Hardware Redesign and Requal (Solid Rocket Motor Upgrade (SRMU) and hardware obsolescence) - (U) \$21,867 Continue integration for Milstar - (U) \$87,443 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: right; width: 10%;"><u>FY 1997</u></th> <th style="text-align: right; width: 10%;"><u>FY 1998</u></th> <th style="text-align: right; width: 10%;"><u>FY 1999</u></th> <th style="text-align: right; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998 PB)</td> <td style="text-align: right;">97,487</td> <td style="text-align: right;">82,384</td> <td style="text-align: right;">137,602</td> <td style="text-align: right;">3,320,678</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">102,472</td> <td style="text-align: right;">74,884</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Gen Reductions</td> <td style="text-align: right;">-2,403</td> <td style="text-align: right;">-2,482</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: right;">-2,582</td> <td style="text-align: right;">-1,919</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td style="text-align: right;">-4,052</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming (BTR)</td> <td style="text-align: right;">-15,579</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: right;">-154</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-50,159</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/ FY1999 President's Budget</td> <td style="text-align: right;">77,702</td> <td style="text-align: right;">70,483</td> <td style="text-align: right;">87,443</td> <td style="text-align: right;">3,116,410</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: In FY97, \$15,579K was reprogrammed to fund higher priorities, and an additional \$750K is pending reprogramming to fund higher priorities. In FY98, \$10.48M is pending reprogramming to fund higher priorities. FY99 funds transfer put DSP recurring integration into the Titan Missile Procurement line. The restructure of the Titan 41-vehicle program to 40 vehicles caused reductions in FY99. Higher Air Force priorities also caused FY99 funding to be transferred from Titan to other programs.</p> <p style="padding-left: 20px;">Schedule: Program has been curtailed to 40 vehicles under the restructure; last launch of Titan IV is scheduled for FY2004.</p> <p style="padding-left: 20px;">Technical: No changes</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY1998 PB)	97,487	82,384	137,602	3,320,678	(U) Appropriated Value	102,472	74,884			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions	-2,403	-2,482			b. SBIR	-2,582	-1,919			c. Omnibus or Other Above Threshold Reprogram	-4,052				d. Below Threshold Reprogramming (BTR)	-15,579				e. Rescissions	-154				(U) Adjustments to Budget Years Since FY1998 PB			-50,159		(U) Current Budget Submit/ FY1999 President's Budget	77,702	70,483	87,443	3,116,410
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Project 4135	Page 2 of 5 Pages	Exhibit R-2 (PE 0305144F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305144F Titan Space Launch Vehicles (Space)			PROJECT 4135		
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) Missile Procurement, Budget Activity 45, P-24, Space and Other Support	317,881	450,934	578,540	469,698	405,947	299,612	238,179	308,500	7,209,591
<u>Related RDT&E:</u>									
(U) Not Applicable									
 (U) D. <u>Schedule Profile</u>									
		<u>FY 1997</u>			<u>FY 1998</u>		<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	
(U) Draft Single Acquisition Management Plan (SAMP) to OSD staff					X				
(U) 40-Vehicle Production and Launch Operations Contract Definitization					X				
(U) Titan IV-B (SRMU) Initial Operational Capability (IOC)		X							
(U) Titan Development (Hardware Requal) Contract Definitization					X				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305144F Titan Space Launch Vehicles (Space)				PROJECT 4135		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Titan IV										
	(U) Contract Costs R&D (85-C-0019/96-C-0035)			52,797	55,886	65,576				
	(U) Contract Costs Unified Payload Integ (92-C-0028/ 98-C-0005)			6,205	14,597	21,867				
	(U) Other Government Costs			18,700						
(U) Total				77,702	70,483	87,443				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC *</u>	<u>Project Office EAC *</u>	<u>Total Prior to FY 1997**</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
LMC 85-C-0019	SS/FPIF	1QFY85	11,110,900	11,203,100	2,206,317	0	0	0	0	2,206,317
LMC 85-C-0085	SS/FPIF	1QFY85	638,600	638,600	82,067	0	0	0	0	82,067
LMC 92-C-0028	SS/CPAF	3QFY92	594,422	585,149	90,851	2,292	0	0	0	93,143
LMC 96-C-0035	SS/CPAF	3QFY96	57,840	166,661	69,666	52,797	55,886	65,576	35,343	279,268
LMC 98-C-0005	SS/CPAF	1QFY98	292,939	292,939	0	3,913	14,597	21,867	79,456	119,833
Facilities	n/a	n/a			93,300	0	0	0	0	93,300
Project 4135										
Page 4 of 5 Pages										
Exhibit R-3 (PE 0305144F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305144F Titan Space Launch Vehicles (Space)					PROJECT 4135
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC *	Project Office EAC *	Total Prior to FY 1997**	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
Tecolote, SRS, TRW, Antioch, Aerospace			N/A	N/A	150,546	14,100	0	0	0	164,646
			N/A	N/A	73,236	4,600	0	0	0	77,836
<u>Test and Evaluation Organizations</u>										
0			N/A	N/A	0	0	0	0	0	0
<u>Government Furnished Property</u> : None										
Subtotal Product Development					2,542,201	59,002	70,483	87,443	114,799	2,873,928
Subtotal Support and Management					223,782	18,700	0	0	0	242,482
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					2,765,983	77,702	70,483	87,443	114,799	3,116,410
* NOTE: The Estimates at Complete are at the contract level and therefore include work funded by the National Reconnaissance Office, NASA and other customers. Thus, the EACs include more than just Air Force funding requirements.										
* * These figures are only Air Force Titan IV RDT&E funds										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Tactical Terminals
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	2,794	243	237	243	245	249	255	0	TBD
4394 Combat Intelligence System	1,949	0	0	0	0	0	0	0	5,072
4395 Radio	845	243	237	243	245	249	255	Cont	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) Note: The funding request for Project 4394 Combat Intelligence System (CIS) for FY98 and later has been transferred into PE 0207414F. Together with other funds from PEs 0604321F and 0207431F, this was done to consolidate RDT&E funding in a single PE, for program clarity, and reporting efficiency.

(U) A. Mission Description and Budget Item Justification

This program was established as part of the Air Force Tactical Exploitation of National Capabilities (TENCAP) normalization effort. Recently, the Constant Source Operator Terminal (CSOT) functionality was transformed into the Combat Intelligence System (CIS). This terminal processes the near-real-time threat information utilized by combat units/aircrews for mission planning and execution. The radio project in this program enables the warfighter to access critical data provided by national and tactical intelligence sources. Currently over 130 ground systems are deployed. Air Force is jointly developing and procuring an airborne qualified radio called Multi-mission Advanced Tactical Terminal (MATT) with US Special Operations Command (SOCOM), Defense Support Program Office (DSPO), and the Navy. This Program Element is assigned in Budget Activity 7, Operational System Development because it involves post-Milestone III efforts and supports development of operational systems.

(U) Acquisition Strategy:

Project 4394 - Full and open competition led to a Cost Plus Award Fee contract with Lockheed Martin Command and Control Systems.

Project 4395 - Technology transfer from the Naval Research Laboratory to the contractor. Evolutionary acquisition strategy was implemented with a core capability procured during the first production option. Firm Fixed Price.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305158F Tactical Terminals					
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget (FY 1998 PB)	2,799	258	242	TBD					
(U) Appropriated Value	2,914	258							
(U) Adjustments to Appropriated Value									
a. Cong Reductions	-70	-11							
b. Small Business Innovative Research	-45	-4							
c. Below Threshold Reprogramming									
d. Rescissions	-5								
(U) Adjustments to Budget Years Since FY 1998 PB			-5						
(U) Current Budget Submit/FY 1999 President's Budget	2,794	243	237	TBD					
 (U) Change Summary Explanation:									
Funding: N/A									
Schedule: N/A									
Technical: N/A									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
(U) Other Procurement, AF (0305158F)	7,293	6178	4,243	3,591	3,667	4,483	4,499	<u>Compl</u>	<u>Cost</u>
(U) O&M, PE 0207431, CAIS	3,479	3,740	4,911	4,941	5,180	5,557	5,781	Cont	TBD
 (U) D. <u>Schedule Profile</u> - See individual projects for Schedule Profiles.									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305158F Tactical Terminals				PROJECT 4394	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4394 Combat Intelligence System	1,949	0	0	0	0	0	0	0	5,072
Quantity of RDT&E Articles									
<p>(U) Note: The funding request for Project 4394 Combat Intelligence System (CIS) for FY98 and later has been reprogrammed into PE 0207414F. Together with other funds from PEs 0604321F and 0207431F, this was done to consolidate RDT&E funding in a single PE, for program clarity, and reporting efficiency.</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>(U) Combat Intelligence System (CIS) is the Air Force's single, standard automated intelligence system optimizing both component and unit-level intelligence functions to provide warfighters with the most accurate and timely intelligence data available. CIS is the core capability for automating the receipt, correlation, and dissemination of intelligence information to a variety of intelligence and operational systems which support combat planning and execution. As the intelligence segment to Theater Battle Management Core Systems (TBMCS), it provides an automated capability at the component and unit levels to rapidly receive and process all-source intelligence data to support Contingency Theater Automated Planning System (CTAPS). CIS builds and maintains in-theater situational awareness during deployment to the theater and provides indications and warning support after arrival. CIS provides the capability to receive all-source intelligence near-real-time from national, theater, and tactical reconnaissance platforms. CIS is electronically interoperable and compatible with other intelligence systems, providing an integrated network capable of intelligence support to decision makers, battle planners, mission planners, and warfighters.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$ 245 Completed Studies for CIS intelligence interoperability - (U) \$ 1,202 Completed CIS software development under TBM Core Systems - (U) \$ 502 Implemented results of studies into CIS software under TBM Core Systems - (U) \$ 1,949 Total <p>(U) <u>FY 1998 (\$ in Thousands)*:</u></p> <ul style="list-style-type: none"> - (U) \$ 0 Total <p>(U) <u>FY 1999 (\$ in Thousands)*:</u></p> <ul style="list-style-type: none"> - (U) \$ 0 Total <p>* FY 1998 and FY 1999: Funding is budgeted in PE 0207414F.</p>									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Tactical Terminals	PROJECT 4394
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) FY 1998 President's Budget	1,954	0	0	1,954
(U) Appropriated Value	2,035			
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-49			
b. Small Business Innovative Research	-32			
c. Below Threshold Reprogramming				
d. Rescissions	-5			
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) FY 1999 President's Budget	1,949	0	0	1,949

(U) Change Summary Explanation:

Funding: N/A
 Schedule: N/A
 Technical: N/A

(U) C. Other Program Funding Summary (\$ in Thousands) - See Other Program Funding Summary above.

(U) D. Schedule Profile

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) CIS 1.2 Release			X									
(U) TBMCS Contract Award												
(U) TBMCS 1.0 Release								X				
(U) Initial Operational Capability						X						

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305158F Tactical Terminals			PROJECT 4394		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Software Development					1,634	0	0			
(U) Systems Engineering Support					130	0	0			
(U) Program Management Support					185	0	0			
(U) Total					1,949	0	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Lockheed Martin Cmnd & Ctrl Syst F19628-95-C0143 and various others	SS/CPAF	Oct 95	Complete	Complete	2,301	1,634	0	0	0	3,935
<u>Support and Management Organizations</u>										
MITRE		On going	N/A	N/A	551	130	0	0	0	681
TEMS Various Contractors		On going	N/A	N/A	271	185	0	0	0	456
<u>Test and Evaluation Organizations</u> - N/A										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Tactical Terminals	PROJECT 4394
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: N/A

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
N/A									
<u>Support and Management Property</u>									
N/A									
<u>Test and Evaluation Property</u>									
N/A									
Subtotal Product Development				2,301	1,634	0	0	0	3,935
Subtotal Support and Management				822	315	0	0	0	1,137
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				3,123	1,949	0	0	0	5,072

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Tactical Terminals	PROJECT 4395
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4395 Radio	845	243	237	243	245	249	255	Cont	TBD
Quantity of RDT&E Articles									

(U) A. Mission Description and Budget Item Justification

(U) This program provides the capability to receive near-real-time threat information utilized by combat units/aircrews for threat warning, mission planning, and execution. It enables the warfighter to access critical data provided by national and tactical intelligence sources. Current fielded radios include the Tactical Receive Equipment (TRE) and Multi-mission Advanced tactical terminal (MATT). The MATTS are being integrated into air and ground platforms which require tactical broadcast functionality. The follow on capability will be provided by the Joint Tactical Terminal and/or Common Integrated Broadcast Service Modules (CIBS-M).

(U) FY 1997 (\$ in Thousands):

- (U) \$ 150 Planned and supported integration on DoD aircraft and weapon systems
- (U) \$ 595 Supported MATT radio P³I development effort
- (U) \$ 100 Supported migration of MATT into next generation tactical terminal
- (U) \$ **845 Total**

(U) FY 1998 (\$ in Thousands):

- (U) \$ 95 Continue to plan and support integration on DoD aircraft and weapon systems
- (U) \$ 103 Continue to support migration of MATT into next generation tactical terminal
- (U) \$ 45 Continue MATT radio P³I development effort
- (U) \$ **243 Total**

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Tactical Terminals	PROJECT 4395
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(U) FY 1999 (\$ in Thousands):

- (U) \$ 147 Continue to plan and support integration on DoD aircraft and weapon systems
- (U) \$ 90 Continue to support migration of MATT into next generation tactical terminal
- (U) \$ 237 **Total**

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) FY 1998 President's Budget	845	258	242	TBD
(U) Appropriated Value	879	258		
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-21	-11		
b. Small Business Innovative Research	-13	-4		
c. Rescissions				
(U) Adjustments to Budget Years Since FY 1998 PB			-5	
(U) FY 1999 President's Budget	845	243	237	TBD

(U) Change Summary Explanation:

Funding: N/A
 Schedule: N/A
 Technical: N/A

(U) **C. Other Program Funding Summary (\$ in Thousands)** - See Other Program Funding Summary above.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305158F Tactical Terminals	PROJECT 4395
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Exercise FY97 Production Option	*											
(U) FY97 Production Run/Delivery Start				X								
(U) Delivery to Platform Start			*									
(U) Block II Production						X						

* denotes completed events

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305158F Tactical Terminals				PROJECT 4395	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Software Development				515	55	41			
(U)	Travel				100	71	73			
(U)	Government Engineering Support				230	117	123			
(U)	Total				845	243	237			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Allied Signal, Inc. MDA911-93- C0008 and TBD	FFP	Apr 93	TBD	TBD	0	515	58	42	Cont	TBD
<u>Support and Management Organizations</u>										
Mission Support		Ongoing			0	330	185	195	Cont	TBD
<u>Test and Evaluation Organizations</u>										
					0	0	0	0		
Government Furnished Property: N/A										
Project 4395					Page 10 of 11 Pages			Exhibit R-3 (PE 0305158F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305158F Tactical Terminals			PROJECT 4395		
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
N/A									
<u>Support and Management Property</u>									
N/A									
<u>Test and Evaluation Property</u>									
N/A									
Subtotal Product Development				0	515	58	42	Cont	TBD
Subtotal Support and Management				0	330	185	195	Cont	TBD
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project					845	243	237	Cont	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305160F Def Meteorological Satellite Prog (Space)	PROJECT 0001
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0001 DMSP	17,618	12,425	20,432	21,027	18,931	14,246	11,128	19,700	295,149
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification
 The Defense Meteorological Satellite Program (DMSP) is a fully operational joint-service program supporting all military services. Operational commanders require timely, quality weather information to effectively employ weapon systems and protect DoD resources. DMSP is the DoD's most important and often the only source of global weather data. It provides visible and infrared cloud cover imagery (1/3 nm constant resolution) and other meteorological, oceanographic, and solar-geophysical information. This data is required over the entire earth to support global and theater military operations. At least two satellites are required in sun synchronous 450nm polar orbit at all times (sun synchronous means the satellites cross the equator at the same local sun time on each of their 14 orbits/day). Vice President Gore's National Performance Review directed convergence of DMSP with NOAA's weather satellite system. DMSP satellite operations will consolidate with NOAA satellite operations at NOAA's Suitland MD Satellite Operations Control Center (SOCC) in FY 98. This program is in Budget Activity 7, Operational Systems Development, because it supports the current operational DMSP constellation.

(U) Acquisition Strategy

Support and services contracts for the spacecraft, sensors, ground systems, and supporting software have been awarded to various contractors. Since no major milestone decisions remain, future considerations facing the program center on successful completion of current contracts, the need for future contractor support of the procured spacecraft, sensors, and ground systems.

(U) FY 1997 (\$ in Thousands)

- (U) \$12,575 Continue system integration and test, calibration and validation, and related support activities.
- (U) \$325 Complete Small Tactical Terminal (field portable weather terminal) enhanced algorithm development and implementation.
- (U) \$1,377 Begin Mark IVB tactical weather terminal software upgrade for the next block of satellites (5D-3)
- (U) \$2,200 Continue support of civilian (DOC/NOAA)/military command and control consolidation efforts
- (U) \$1,141 Continue Titan II integration effort (transition from Atlas E due to inventory depletion)
- (U) \$17,618 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305160F Def Meteorological Satellite Prog (Space)	PROJECT 0001																																																							
<p>(U) <u>FY 1998 (\$ in Thousands)</u></p> <ul style="list-style-type: none"> - (U) \$11,181 Continue system integration and test, calibration and validation, and related support activities. - (U) \$200 Continue Titan II integration effort (transition from Atlas E due to inventory depletion). - (U) \$1,044 Continue Mark IVB tactical weather terminal software upgrade for the next block of satellites (5D-3) - (U) \$12,425 Total <p>(U) <u>FY 1999 (\$ in Thousands)</u></p> <ul style="list-style-type: none"> - (U) \$15,035 Continue system integration and test, calibration and validation, and related support activities. - (U) \$1,474 Continue Titan II integration effort (transition from Atlas E due to inventory depletion). - (U) \$2,358 Begin EELV interface design (transition to EELV) - (U) \$1,000 Begin Small Tactical Terminal (field portable weather terminal) SSMIS software upgrades. - (U) \$565 Continue Mark IVB tactical weather terminal software upgrade for the next block of satellites (5D-3) - (U) \$20,432 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998)</td> <td style="text-align: center;">14,769</td> <td style="text-align: center;">14,076</td> <td style="text-align: center;">19,143</td> <td style="text-align: center;">297,862</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">15,664</td> <td style="text-align: center;">14,076</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Gen Reductions</td> <td style="text-align: center;">-533</td> <td style="text-align: center;">-1,364</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: center;">-362</td> <td style="text-align: center;">-287</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Above Threshold Reprogramming*</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td style="text-align: center;">2,875</td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Recission</td> <td style="text-align: center;">-26</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY1998 PB</td> <td></td> <td></td> <td style="text-align: center;">1,289</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY1999 Presidents Budget</td> <td style="text-align: center;">17,618</td> <td style="text-align: center;">12,425</td> <td style="text-align: center;">20,432</td> <td style="text-align: center;">300,349</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: FY 97 Omnibus reprogramming (\$5M) funds SSMIS settlement Omnibus increase has been processed but is not yet reflected in the funding database. FY 99 adjusted - (2,000) funds DMSP EELV interface design, -711 funded higher priority AF and DoD requirements. Schedule: F-14 launch 3QFY97</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY1998)	14,769	14,076	19,143	297,862	(U) Appropriated Value	15,664	14,076			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions	-533	-1,364			b. SBIR	-362	-287			c. Omnibus or Above Threshold Reprogramming*					d. Below Threshold Reprogramming	2,875				e. Recission	-26				(U) Adjustments to Budget Years Since FY1998 PB			1,289		(U) Current Budget Submit/FY1999 Presidents Budget	17,618	12,425	20,432	300,349
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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(U) Current Budget Submit/FY1999 Presidents Budget	17,618	12,425	20,432	300,349																																																					
Project 0001	Page 2 of 6 Pages	Exhibit R-2 (PE 0305160F)																																																							

		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305160F Def Meteorological Satellite Prog (Space)	
Technical: No changes.		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305160F Def Meteorological Satellite Prog (Space)				PROJECT 0001		
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) Missile Procurement/PE 0305160F (Budget Activity 5, Line Item P-27)		31,556	33,295	36,066	40,366	60,325	40,850	49,580	105,400	1,985,090
(U) Other Procurement/PE 0305160F (Line Item P-63)		15,215	13,278	12,442	6,800	5,496	4,998	2,738	0	288,139
<u>Related RDT&E:</u>										
(U) PE 0603434F, National Polar Operational Environmental Satellite System (NPOESS)										
(U) PE 0305160N, DMSP (provides funds for Navy unique studies)										
(U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
		1	2	3	4	1	2	3	4	
(U) Small Tactical Terminal Delivery Start	X									
(U) Small Tactical Terminal Deliveries Complete									X	
(U) Small Tactical Terminal FOT&E	X									
(U) 5D-3 Spacecraft Delivery (S16-20)	X		X		X		X			
(U) 5D-2 Launches (F-14/F-15)			X						X	
(U) Suitland SOC IOC (DMSP Ops)					X					
(U) DMSP SOC (Offutt AFB) Closure							X			
Project 0001										
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Exhibit R-2 (PE 0305160F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305160F Def Meteorological Satellite Prog (Space)			PROJECT 0001		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Launch Vehicle Transition					1,141	200	3,832			
(U) Spacecraft Integration and Test					2,706	3,678	7,122			
(U) Calibration/Validation					155	0	359			
(U) Algorithm Development					1,405	916	838			
(U) SSMIS Settlement					44	0	0			
(U) MARK IVB/STT Enhancements					1,749	1,138	1,565			
(U) Systems Engineering Support					4,339	2,826	2,777			
(U) Program Management Support					3,879	3,667	3,939			
(U) Command and Control Consolidation					2,200	0	0			
(U) Total					17,618	12,425	20,432			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Product Development Organizations</u>										
Lockheed -Martin	SS/CPAF	Apr 92	3,764	3,764	3,764	0	0	0	0	3,764
Lockheed-Martin	SS/CPAF	May 97	9,870	9,870	0	122	593	3,391	5,764	9,870
Northrop-Grummm	SS/CPAF	May 95	3,958	3,958	1,350	0	408	2,050	150	3,958
Lockheed-Martin	C/CPAF	Oct 88	39,513	39,513	39,466	47	0	0	0	39,513
Harris	C/CPAF	Jun 94	5,380	5,380	4,961	325	94	0	0	5,380
SM-ALC	FCA	Jan 97	4,168	4,168	0	1,377	1,044	565	1,182	4,168
SMC/CL (Titan)	PO	Oct 94	6,579	6,579	614	1,141	200	1,474	3,150	6,579
Project 0001					Page 4 of 6 Pages			Exhibit R-3 (PE 0305160F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE
BUDGET ACTIVITY										February 1998
7 - Operational System Development					PE NUMBER AND TITLE					PROJECT
					0305160F Def Meteorological Satellite Prog (Space)					0001
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Aerojet	SS/CPAF	May 92	2,530	2,530	2,023	507	0	0	0	2,530
Aerojet	C/CPAF	Mar 89	86,791	86,791	80,949	191	451	200	0	81,791
TBD (SSMIS Sys Eng Spt)	TBD	Dec 97			0	0	685	1,411	3,366	5,462
Hughes	SS/CPFF	May 96	250	250	15	23	70	70	72	250
Phillips Lab	MIPR/PD	Oct 95			2,821	1,142	831	911	Cont	Cont
TBD (STT S/W Upgrades)	TBD	TBD			0	0	0	1,000	3,800	4,800
NRL	MIPR/Various	Oct 95			1,776	1,279	865	1,363	Cont	Cont
APL	MIPR/Various	Oct 95			928	550	491	690	Cont	Cont
SMC (Det 3 SSSG)	FCA	Dec 95			306	2,200	0	0	0	2,506
Sandia	MIPR/Various	Oct 96			200	240	200	361	Cont	Cont
Other	Various				1,893	256	0	230	Cont	Cont
<u>Support and Management Organizations</u>										
FFRDC	MORD*	Oct 95			7,401	2,689	1,726	1,577	Cont	Cont
PRC/bd Systems	C/CPAF	Aug 95			1,566	1,650	1,100	1,200	Cont	Cont
Program Mgmt					5,842	3,879	3,667	3,939	Cont	Cont
Litigation Support					1,809	0	0	0	0	1,809
Other	Various	Jul 91			1,958	0	0	0	0	1,958

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)					DATE February 1998																																											
BUDGET ACTIVITY		PE NUMBER AND TITLE			PROJECT																																											
7 - Operational System Development		0305160F Def Meteorological Satellite Prog (Space)			0001																																											
<p>*MORD - Miscellaneous Obligation/Reimbursement Document -a vehicle/method for committing and obligating funds. In this case the program office sends a letter to SMC/FM to commit & obligate the funds programmed for Aerospace support.</p> <p><u>Test and Evaluation Organizations</u> Not Applicable.</p> <p>(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u></p> <p>Government Furnished Property: Not Applicable.</p> <table border="0"> <thead> <tr> <th></th> <th>Prior to</th> <th></th> <th></th> <th></th> <th>Budget to</th> <th>Total</th> </tr> <tr> <th></th> <th><u>FY 97</u></th> <th><u>FY 97</u></th> <th><u>FY 98</u></th> <th><u>FY 99</u></th> <th><u>Complete</u></th> <th><u>Program</u></th> </tr> </thead> <tbody> <tr> <td>Subtotal Product Development</td> <td>141,066</td> <td>9,400</td> <td>5,932</td> <td>13,716</td> <td>Cont</td> <td>Cont</td> </tr> <tr> <td>Subtotal Support and Management</td> <td>18,576</td> <td>8,218</td> <td>6,493</td> <td>6,716</td> <td>Cont</td> <td>Cont</td> </tr> <tr> <td>Subtotal Test and Evaluation</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>Project Total</td> <td>159,642</td> <td>17,618</td> <td>12,425</td> <td>20,432</td> <td>Cont</td> <td>Cont</td> </tr> </tbody> </table>								Prior to				Budget to	Total		<u>FY 97</u>	<u>FY 97</u>	<u>FY 98</u>	<u>FY 99</u>	<u>Complete</u>	<u>Program</u>	Subtotal Product Development	141,066	9,400	5,932	13,716	Cont	Cont	Subtotal Support and Management	18,576	8,218	6,493	6,716	Cont	Cont	Subtotal Test and Evaluation	0	0	0	0	0	0	Project Total	159,642	17,618	12,425	20,432	Cont	Cont
	Prior to				Budget to	Total																																										
	<u>FY 97</u>	<u>FY 97</u>	<u>FY 98</u>	<u>FY 99</u>	<u>Complete</u>	<u>Program</u>																																										
Subtotal Product Development	141,066	9,400	5,932	13,716	Cont	Cont																																										
Subtotal Support and Management	18,576	8,218	6,493	6,716	Cont	Cont																																										
Subtotal Test and Evaluation	0	0	0	0	0	0																																										
Project Total	159,642	17,618	12,425	20,432	Cont	Cont																																										
Project 0001		Page 6 of 6 Pages			Exhibit R-3 (PE 0305160F)																																											

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development			PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq) (Space)					PROJECT 3028			
COST (\$ In Thousands)			FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3028 Navstar GPS			33,760	43,627	67,238	45,145	22,060	15,257	15,860	Continuing	Continuing
Quantity of RDT&E Articles			0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification**

The Global Positioning System (GPS) is a space-based radio positioning, navigation, and time distribution system. GPS User Equipment (UE) consists of standardized receivers, antennae, antenna electronics, etc., grouped together in sets to derive navigation and time information transmitted from GPS satellites. These receiver sets are used by all Services and DoD. RDT&E funds UE development and testing, studies and engineering to assist UE aircraft integration, software upgrades, product improvement studies, commercial GPS UE test and evaluation, and mission support. Due to increasing military GPS dependence and emerging Electronic Warfare (EW) threat, Navigation Warfare (Navwar) program established to address EW solutions for GPS. The three tenets of Navwar are to protect U.S. military and allies' use of GPS, prevent hostile exploitation of GPS, and preserve civil use of GPS outside the area of responsibility (AOR). This program element is in Budget Activity 7 - Operational System Development, because UE passed Milestone IIIB January 1992.

Acquisition Strategy: Centrally develop and procure GPS receiver sets for all DoD platforms. Hardware upgrades/modernization accomplished through information and requirements dissemination to industry and study efforts to evaluate alternatives. Individual hardware procurements will be competitively awarded to single vendors. Navwar Advanced Concept Technology Demonstrations (ACTD) provide proof of concept and results feed into ongoing Analyses of Alternatives (AoA). Identified solutions allow start of Engineering Manufacturing Development (EMD) of Navwar UE in FY99.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 870 Continued aircraft integration development testing
- (U) \$ 888 Continued user equipment development and product improvement testing
- (U) \$ 1,970 Continued Advanced Concept Technology Demonstration (ACTD) - Protection
- (U) \$ 1,674 Continued Advanced Concept Technology Demonstration (ACTD) - Prevention
- (U) \$ 1,300 Continued Support Contracts
- (U) \$ 3,566 Continued in-house support
- (U) \$ 4,763 Continued Selective Availability Anti-Spoofing Module (SAASM) development
- (U) \$ 3,821 Began Navigation Warfare (NAVWAR) Evaluation Team (NET)
- (U) \$ 3,999 Began classified requirement
- (U) \$ 7,763 Began NAVWAR Industry Studies

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq) (Space)	PROJECT 3028
<ul style="list-style-type: none"> - (U) \$ 2,125 Continued NAVWAR Other Studies - (U) \$ 1,021 Began GPS Modernization/Stewardship Efforts - (U) \$33,760 Total 		
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<ul style="list-style-type: none"> - (U) \$ 800 Continue aircraft integration development testing - (U) \$ 1,000 Continue development and product improvement testing and evaluation - (U) \$ 4,800 Continue ACTD - Protection - (U) \$ 3,300 Continue ACTD - Prevention - (U) \$10,588 Continue SAASM development - (U) \$ 7,850 Continue NET - (U) \$ 3,467 Continue NAVWAR Industry Studies - (U) \$ 1,400 Continue support contracts - (U) \$ 3,122 Continue in-house support - (U) \$ 6,800 Continue classified requirement - (U) \$ 500 Begin security infrastructure - (U) \$43,627 Total 		
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p>		
<ul style="list-style-type: none"> - (U) \$ 731 Continue aircraft integration development testing - (U) \$ 5,300 Continue development and product improvement testing and evaluation - (U) \$ 8,800 Continue ACTD - Protection - (U) \$ 2,300 Continue ACTD - Prevention - (U) \$ 5,300 Continue SAASM development - (U) \$ 1,600 Continue NET - (U) \$ 1,500 Continue support contracts - (U) \$ 3,107 Continue in-house support - (U) \$38,600 Begin NAVWAR Engineering Manufacturing Development (EMD) - (U) \$67,238 Total 		
Project 3028	Page 2 of 8 Pages	Exhibit R-2 (PE 0305164F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq) (Space)			PROJECT 3028		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget (FY1998 PB)	29,810	46,300	68,590	Continuing					
(U) Appropriated Value	31,250	46,300							
(U) Adjustments to Appropriated Value									
a. Cong Gen Reductions	-734	-1,533							
b. SBIR	-706	-1,140							
c. Omnibus or Other Above Threshold Reprogram									
d. Below Threshold Reprogramming	3,999								
e. Rescission	-49								
(U) Adjustments to Budget Years Since FY1998 PB			-1,352						
(U) Current Budget Submit/FY1999 President's Budget	33,760	43,627	67,238	Continuing					
 (U) Change Summary Explanation: Funding: FY97 Below Threshold Reprogramming (BTR) for a classified requirement (\$3,999), rescission for Bosnia Supplemental (-\$49). FY99 Nonpay inflation adjustment (-\$1,352). Schedule: Schedule changes result from GPS Joint Program Office (User Equipment Segment) projects realignment. Technical: No Changes									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Operations and Maintenance (PE 0305164F, BA 1 - Operating Forces, SAG 13D)	1,208	1,484	1,964	2,431	2,621	2,661	2,769	Cont	Cont
(U) Aircraft Procurement (PE 0305164F, BA 7, Aircraft Support Equipment, BP19, P-74)	36,558	42,946	44,293	37,946	57,237	100,254	135,528	Cont	Cont
(U) Other Procurement (PE 0305164F, BP 63 - Electronics & Telecommunications Equipment, WSC 6730, P-62)	1,893	1,513	1,462	3,830	3,819	4,241	4,371	Cont	Cont
(U) OSD RDT&E (ACTD Funding: PE 0603750D)	4,500	3,900	300						
Project 3028									
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq) (Space)	PROJECT 3028	
<u>Related RDT&E:</u>			
(U) PE 0305165F, NAVSTAR GPS (Space/Grd Segments)			
(U) PE 0604480F, GPS Block IIF			
(U) PE 0305176F, Combat Survivor/Evader Locator			
 (U) D. <u>Schedule Profile</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
	1 2 3 4	1 2 3 4	1 2 3 4
(U) GPS Modernization (Acquisition Master Plan)		x	
(U) GPS Modernization (ORD/JROC)			x
(U) GPS Modernization (Prgm Decision)			x
(U) NAVWAR Next Generation UE (Independent Studies/AOA/PRDAs) complete			x
(U) NAVWAR Next Generation UE EMD begins			x
(U) NAVWAR ACTD Dev/Qual complete		x	
(U) NAVWAR ACTD Demos begin		x	
Project 3028			Page 4 of 8 Pages
			Exhibit R-2 (PE 0305164F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE	
7 - Operational System Development		February 1998	
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT	
7 - Operational System Development	0305164F Navstar Global Pos Sys (User Eq) (Space)	3028	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Technical Support for Aircraft Integrations	870	800	731
(U) Development & Product Improvement Testing	888	1,000	5,300
(U) ACTD - Protection	1,970	4,800	8,800
(U) ACTD - Prevention	1,674	3,300	2,300
(U) Support Contracts	1,300	1,400	1,500
(U) In-House Support	3,566	3,122	3,107
(U) SAASM	4,763	10,588	5,300
(U) NET	3,821	7,850	1,600
(U) NAVWAR Industry Studies	7,763	3,467	
(U) Other NAVWAR Studies	2,125		
(U) Classified Requirement	3,999	6,800	
(U) GPS Modernization/Stewardship	1,021		
(U) Security Infrastructure		500	
(U) NAVWAR EMD			38,600
(U) Total	33,760	43,627	67,238

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq) (Space)				PROJECT 3028	
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Rockwell (MAGR)	FPIF/FFP/ CPAF	Various	19,293	19,293	19,293	36	0	0	0	19,329
DOE Sandia (SAASM)	MIPR	Feb 94	18,669	18,669	3,235	2,334	3,600	1,400	8,100	18,669
NAWC (SAASM)	MIPR	Oct 95	760	760	599	161	0	0	0	760
Various (SAASM)	Various	Various	Various	Various	0	401	6,988	3,900	0	11,289
Alliant Techsys Inc (SAASM)	CPFF	Oct 95	4,414	4,414	2,547	1,867	0	0	0	4,414
Multiple (NAVWAR PRDAs)	CPAF	Aug 96	23,110	23,110	1,446	7,763	3,467	0	10,434	23,110
Holloman AFB (Integration)	Project Order	N/A	6,191	6,191	0	870	800	731	3,790	6,191
General Dynamics (Various)	Time and Materials	Jan 96	1,810	1,810	1,810	0	0	0	0	1,810
Various (ACTD Prevention)	Various	Various	7,774	7,774	0	1,674	3,300	2,300	500	7,774
Various (ACTD Protection)	Various	Various	26,142	26,142	572	1,970	4,800	8,800	10,000	26,142
Project 3028					Page 6 of 8 Pages			Exhibit R-3 (PE 0305164F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq) (Space)				PROJECT 3028	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Various (NET)	Various	Various	14,971	14,971	0	3,821	7,850	1,600	1,700	14,971
Various (Classified Requirement)	Various	Various	10,799	10,799	0	3,999	6,800	0	0	10,799
Various (Security Infrastructure)	Various	Various	1,000	1,000	0	0	500	0	500	1,000
Various (EMD)	Various	Various	69,000	69,000	0	0	0	38,600	30,400	69,000
<u>Support and Management Organizations</u>										
Overlook Sys (DUSD/Space)	C/CPFF	Dec 95	Cont	Cont	10,476	1,300	1,400	1,500	Cont	Cont
Aerospace Corp (Technical Supt)	CPFF	Various	Cont	860	800	60	0	0	0	860
SMC/FMB (Shared Prg Cost)	Various	Various	Cont	Cont	1,684	2,414	625	750	Cont	Cont
PRC (Technical Supt)	Time and Materials	Dec 95	714	714	714	0	0	0	0	714
Miscellaneous (In-house support)	Various	Various	Cont	Cont	417	1,056	2,497	1,357	Cont	Cont
Advanced UE Technology Investment (Technical Support) (GPS Modernization)	Various	Various	Various	Various	0	0	0	1,000	Cont	Cont
	Various	Various	Various	Various	0	1,021	0	0	0	1,021
Project 3028					Page 7 of 8 Pages			Exhibit R-3 (PE 0305164F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305164F Navstar Global Pos Sys (User Eq) (Space)				PROJECT 3028	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Various	Various	Various	Various	Various	0	2,125	0	0	0	2,125
(Other Studies)										
<u>Test and Evaluation Organizations</u>										
46th TG (SAASM/Test)	Project Order	Various	31,987	31,987	31,987	0	0	0	0	31,987
46th TG (NAVWAR Test and Eval)	Project Order	Various	Cont	Cont	0	888	1,000	5,300	7,380	14,568
Government Furnished Property: (U) Not Applicable.										
Subtotal Product Development					29,502	24,896	38,105	57,331	54,990	215,258
Subtotal Support and Management					14,091	7976	4,522	4,607	Cont	Cont
Subtotal Test and Evaluation					31,987	888	1,000	5,300	7,380	46,555
Total Project					75,580	33,760	43,627	67,238	Cont	Cont

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305165F NAVSTAR GPS (Space)	PROJECT 3030
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3030 NAVSTAR GPS (Space & Control)	40,875	25,146	21,155	11,013	8,925	9,059	9,375	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program element funds Research and Development for the NAVSTAR Global Positioning System (GPS) Space and Control segments of the overall GPS program. This includes: satellite development (except Block IIF), procurement, and deployment; training simulators; Mission Operation Support Center (MOSC); and ground control segment operation, including sustaining engineering, space and ground segments upgrades, and R&D efforts to support entire GPS system deployment. This program is in Budget Activity 7 - Operational Systems Development, because it is a post-Milestone III program.

Acquisition Strategy: GPS Operational Control System (OCS) upgrade competitively awarded to a single contractor in July 1995.

(U) FY 1997 (\$ in Thousands)

- (U) Continued system engineering including configuration control
\$4,769
- (U) Continued training simulator development
\$3,388
- (U) Continued OCS Consolidated Contract for Common Operator Support Environment (COSE), OCS Architectural Implementation, and Block IIR full functionality
\$20,901
- (U) Investigated space/control segment solutions as part of GPS Navigation Warfare (NAVWAR) program
\$4,000
- (U) Continued Sensor to Shooter accuracy improvement effort
\$6,314
- (U) Began space long-range planning and analysis
\$269
- (U) Continued GPS Joint Program Office support
\$1,234
- (U) Total
\$40,875

(U) FY 1998 (\$ in Thousands):

DATE
February 1998

BUDGET ACTIVITY

7 - Operational System Development

PE NUMBER AND TITLE

0305165F NAVSTAR GPS (Space)

- (U)	Continue system engineering including configuration management
\$2,246	
- (U)	Continue training simulator development
\$2,566	
- (U)	Continue OCS Consolidated Contract for COSE, OCS Architectural Implementation, and Block IIR Full Functionality
\$13,997	
- (U)	Complete Sensor to Shooter accuracy improvement effort
\$6,045	
- (U)	Continue space long-range planning and analysis
\$137	
- (U)	Complete R&D funding of GPS Joint Program Office support (continues in procurement appropriation)
\$155	
- (U)	Total
\$25,146	

(U) FY 1999 (\$ in Thousands):

- (U)	Continue system engineering including configuration management
\$2,132	
- (U)	Continue training simulator development
\$1,470	
- (U)	Continue OCS Consolidated Contract for COSE, OCS Architectural Implementation, and Block IIR Full Functionality
\$13,916	
- (U)	Complete space long-range planning and analysis
\$137	
- (U)	Begin IIA IMOSC development
\$2,600	
- (U)	Complete OSS interface to AEP
\$900	
- (U)	Total
\$21,155	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305165F NAVSTAR GPS (Space)	PROJECT 3030
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(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	40,442	26,685	21,580	Continuing
(U) Appropriated Value	42,243	26,685		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-899	-882		
b. SBIR	-902	-657		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	500			
e. Rescission	-67			
(U) Adjustments to Budget Years Since FY1998 PB			-425	
(U) Current Budget Submit/FY1999 President's Budget	40,875	25,146	21,155	Continuing

(U) Change Summary Explanation:

Funding: FY97 Below Threshold Reprogramming (BTR) to PE 0303110F for higher priority AF effort(-\$200) and from PE 0305144F to support Auto-Nav test capability on the legacy GPS control system (\$700); BTR from PE 0303131F (\$1,000) and PE 0305911F (\$1,000) for GPS Modernization has been processed but is not yet reflected in funding database.

FY98 BTR from PE 0305110F (\$1,700) and PE 0305911F (\$299) for GPS Modernization has been processed but not yet reflected in funding database.

FY99 non-pay inflation adjustment (-\$425).

Schedule: No change.

Technical: No change.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305165F NAVSTAR GPS (Space)				PROJECT 3030					
(U) C. Other Program Funding Summary (\$ in Thousands)													
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>				
(U) Operations and Maintenance (PE 0305165F, BA 1 - Operating Forces, SAG 13D)	19,972	20,714	25,540	22,650	26,364	26,606	27,452	Cont	Cont				
(U) Missile Procurement (PE 0305165F, BA 5 - Space and Other Support, P-20, 21)	196,965	157,630	174,795	226,822	192,897	134,803	136,487	Cont	Cont				
(U) Other Procurement (PE 0305165F, BP 63 - Electronics and Telecommunications Equipment, WSC 6790, P-68)	10,663	10,060	8,430	1,464	665	795	861	Cont	Cont				
<u>Related RDT&E:</u>													
(U) PE 0305164F, GPS User Equipment													
(U) PE 0101221N, Fleet Ballistic Missile System													
(U) PE 0301357F and 0305913F, Nuclear Detonation Detection System (NDS)													
(U) PE 0305119F Space Boosters (Delta II)													
(U) PE 0604480F, GPS Block IIF													
(U) D. Schedule Profile													
	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>						
	1	2	3	4	1	2	3	4	1	2	3	4	
(U) Delivery of Block IIR software to AFSPC													
(U) GPS NAVWAR system mods investigation ends				x									x
(U) Continue OCS Consolidated Contract													
(U) Phase 1 delivery				x									
(U) Phase 2 delivery									x				
(U) GPS Modernization begins					x								
(U) IIA IMOSC development begins										x			
(U) OSS interface to AEP complete													x
Project 3030													
Page 3 of 5 Pages													
Exhibit R-2 (PE 0305165F)													

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305165F NAVSTAR GPS (Space)			PROJECT 3030		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	System Engineering including Configuration Management				4,769	2,246	2,132			
(U)	Training Simulator Development				3,388	2,566	1,470			
(U)	Operational Control Segment (OCS) Development/Sustainment				20,901	13,997	13,916			
(U)	GPS NAVWAR system mods investigation				4,000					
(U)	Sensor to Shooter				6,314	6,045				
(U)	Space long-range planning				269	137	137			
(U)	Program Office Support				1,234	155				
(U)	IIA IMOSC development						2,600			
(U)	OSS interface to AEP						900			
(U)	Total				40,875	25,146	21,155			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Lockheed-Martin	CPAF	Jun 90	118,856	118,856	118,737	119	0	0	0	118,856
Lockheed-Martin	CPAF/FFP	Jul 95	100,000	100,000	14,595	28,923	21,494	15,386	19,602	100,000
GPS NAVWAR	Various	Various	4,000	4,000	0	4,000	0	0	0	4,000
Applied Research Labs	MIPR	Mar 97	2,675	2,675	0	1,561	1,114	0	0	2,675
L-R Plan - XR	Various	Various	543	543	0	269	137	137	0	543
Project 3030					Page 4 of 5 Pages			Exhibit R-3 (PE 0305165F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305165F NAVSTAR GPS (Space)					PROJECT 3030
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
IIA IMOSC	CPAF	Apr 99	3,500	3,500	0	0	0	2,600	900	3,500
Lockheed Martin	CPAF	Jun 99	900	900	0	0	0	900	0	900
<u>Support and Management Organizations</u>										
System Engineer	Various	Various	N/A	N/A	12,909	4,742	2,246	2,132	Cont	Cont
Program Support	Various	Various	N/A	N/A	5,359	1,234	155	0	0	6,748
<u>Test and Evaluation Organizations</u>										
N/A										
Subtotal Product Development					133,332	34,872	22,745	19,023	Cont	Cont
Subtotal Support and Management					18,268	6,003	2,401	2,132	Cont	Cont
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					151,600	40,875	25,146	21,155	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305182F Eastern Space Launch Facility (Space)	PROJECT 9222
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
9222 Range Standardization and Automation (RSA) Program	33,900	32,018	24,578	49,572	44,465	38,622	39,974	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Two national ranges, the Eastern Range (ER) at Patrick AFB, FL, and the Western Range (WR) at Vandenberg AFB, CA, provide tracking, telemetry, communications, command/control and other support capabilities necessary to safely conduct civil, commercial, and national security spacelift operations, ballistic missile test and evaluation (T&E), and a variety of aeronautical and guided weapons T&E. Range assets are based on 1950s/1960s designs and technology and are arrayed in a highly inefficient, manpower-intensive architecture. Range instrumentation reliability is deteriorating and over 40% of the components are obsolete with no sources of support. The ranges do not provide the responsiveness and flexibility critical to affordably support the nation's spacelift needs. Replacement of the aging systems is a necessity. Range Standardization and Automation (RSA) will completely overhaul and modernize both the ER and the WR, treating the two as a single integrated range system with an Eastern and Western segment. RSA will develop the integrated range system, using remote control and automation techniques to reduce the number of required operators, sites and facilities, and to produce improved responsiveness. The result will be a range system reconfigurable from one major operation to another in less than 4 hours versus 2-3 days, capable of being operated for 20% less cost than current ranges, and supportable through existing Air Force logistics infrastructure and standard practices. RSA is critical to the future of the spacelift ranges; performance and cost goals cannot be achieved without RSA. Categorized as Budget Activity 7, Operational Systems Development, because it upgrades existing operational capabilities with new systems. Funding for RSA design and integration for both Eastern and Western Ranges is consolidated in this Eastern Range program element to reflect the standard range being developed for both ranges. A parallel sustaining improvement and modernization activity for existing range systems is separately funded with procurement funds.

(U) Acquisition Strategy:

The RSA Phase I contract was competitively awarded in FY 1993 to provide interconnection between major ER stations at Antigua and Ascension Islands and the ER Operations Control Center via a satellite communications network; standardize and centralize telemetry processing for the ER and WR; and modernize and automate the Cape Canaveral Communications Network. The FY 1996 RSA Phase IIA contract was competitively awarded to provide a top down systems approach which standardizes the spacelift range architecture, incorporating assets from RSA I, RSA IIA, RSA IIB, selected I&M projects, and selected existing assets. It provides new assets to modernize range safety systems, data processing, communications, command/control, meteorological systems, and imaging. The RSA IIB phase will replace tracking, telemetry and command instrumentation based on the RSA Phase IIA architecture resulting in maximum automation and minimum manning.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE		PROJECT	
7 - Operational System Development	0305182F Eastern Space Launch Facility (Space)		9222	
<u>(U) FY 1997 (\$ in Thousands)</u>				
- (U) \$8,776	Continued RSA Phase I: Integrated and began test of communications network.			
- (U) \$23,396	Continued RSA Phase IIA: Completed range architecture design; developed weather, planning and scheduling, and Control & Display basic infrastructure; and began integration and test of product items for Range Delivery Increment (RDI) 1.			
- (U) \$1,728	Provided program support for System Program Office.			
- (U) \$33,900	Total			
<u>(U) FY 1998 (\$ in Thousands)</u>				
- (U) \$9,542	Continues RSA Phase I: Completes design and begin integration of Consolidated Telemetry Processing System (CTPS). Funds SATCOM lease.			
- (U) \$21,190	Continues RSA Phase IIA: Continues RDI 1 product item development; begins converting communications network infrastructure to a seamless, multipath system, including network controllers and GPS-based timing, and completes product development test of RDI 1.			
- (U) \$1,286	Provides program support for System Program Office.			
- (U) \$32,018	Total			
<u>(U) FY 1999 (\$ in Thousands)</u>				
- (U) \$7,498	Continue RSA Phase I: Finishes integration of CTPS. Completes system test and evaluation. Fund SATCOM lease.			
- (U) \$15,780	Continue RSA Phase IIA: Continue Control & Display integration and test for operational turnover; continue development of communications network including network core. Begin development of voice, video, and data network modernization.			
- (U) \$1,300	Provide program support for System Program Office.			
- (U) \$24,578	Total			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>
(U) Previous President's Budget (FY 1998 PB)	33,956	34,186	33,472	Continuing
(U) Appropriated Value	35,704	34,186		
(U) Adjustments to Appropriated Value				
a. Congressional/General	-820	-1305		
b. SBIR	-928	-863		
c. Omnibus and other Above Threshold				
d. Rescissions	-56			
e. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1998 PB			-8894	
(U) Current Budget Submit/FY 1999 President's Budget	33,900	32,018	24,578	Continuing
Project 9222	<i>Page 2 of 5 Pages</i>			Exhibit R-2 (PE 0305182F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998																																																																																																																																																																																																								
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<p>(U) Change Summary Explanation: Funding: FY 1999 DoD reduction funds higher priority needs. Schedule: FY 1998 reductions delay flight analysis/range safety and communications upgrades by 6 months. Technical: Delay increases risk of range safety failure resulting in launch delay or inadvertent destruction of launch vehicle and payload.</p> <p>(U) C. Other Program Funding Summary (\$ in Thousands)</p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>FY 2000</u></th> <th style="text-align: center;"><u>FY 2001</u></th> <th style="text-align: center;"><u>FY 2002</u></th> <th style="text-align: center;"><u>FY 2003</u></th> <th style="text-align: center;">To <u>Complete</u></th> <th style="text-align: center;">Total <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Other Procurement, AF, BA 03, P-66, Eastern/Western Range I&M Space</td> <td style="text-align: right;">99,175</td> <td style="text-align: right;">79,255</td> <td style="text-align: right;">93,848</td> <td style="text-align: right;">80,918</td> <td style="text-align: right;">96,931</td> <td style="text-align: right;">151,136</td> <td style="text-align: right;">144,384</td> <td style="text-align: center;">Continuing</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) MILCON, AF, Project XUMU983004, Launch Operations Control Center</td> <td></td> <td style="text-align: right;">26,876</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: right;">26,876</td> </tr> </tbody> </table> <p>(U) Related RDT&E: Not Applicable.</p> <p>* In addition to RSA, PE 0305182F includes funds required for ongoing Eastern Range sustaining improvement and modernization (I&M) program. Western Range RSA and I&M are included in PE 0305181F. Funding shown is for both PEs. ** FY 1998 MILCON funds are in PE 0305181F; FY 1998 funds are for the Western Range Operations Control Center (WROCC) to house WROCC RSA systems.</p> <p>(U) D. Schedule Profile</p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:40%;"></th> <th colspan="4" style="text-align: center;"><u>FY 1997</u></th> <th colspan="4" style="text-align: center;"><u>FY 1998</u></th> <th colspan="4" style="text-align: center;"><u>FY 1999</u></th> </tr> <tr> <th></th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> </tr> </thead> <tbody> <tr> <td>(U) RSA Phase I Critical Design Review</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td>(U) RSA Phase IIA System Design Rev</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td>(U) RSA Phase IIA RDI-1 Product Development T&E (1st)</td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) RSA Phase IIA Weather Instrumentation Facilities</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) RSA Phase IIA RDI-1 Product Development T&E (complete)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) RSA Phase I Cape Fiber Optic Network Inst'l</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) RSA Phase I SATCOM Installation</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) WR Ops Cntrl Cntr Beneficial Occupancy Date</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td>(U) RSA Phase IIA RDI-1 System Integration Test Complete</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> </tr> <tr> <td>(U) RSA Phase I Operational T&E</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td>(U) RSA Phase I System Turnover</td> <td></td> <td style="text-align: center;">X</td> <td></td> </tr> </tbody> </table>										<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Complete</u>	Total <u>Cost</u>	(U) Other Procurement, AF, BA 03, P-66, Eastern/Western Range I&M Space	99,175	79,255	93,848	80,918	96,931	151,136	144,384	Continuing	Continuing	(U) MILCON, AF, Project XUMU983004, Launch Operations Control Center		26,876							26,876		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>					1	2	3	4	1	2	3	4	1	2	3	4	(U) RSA Phase I Critical Design Review		X											(U) RSA Phase IIA System Design Rev		X											(U) RSA Phase IIA RDI-1 Product Development T&E (1 st)				X									(U) RSA Phase IIA Weather Instrumentation Facilities							X						(U) RSA Phase IIA RDI-1 Product Development T&E (complete)								X					(U) RSA Phase I Cape Fiber Optic Network Inst'l							X						(U) RSA Phase I SATCOM Installation							X						(U) WR Ops Cntrl Cntr Beneficial Occupancy Date											X		(U) RSA Phase IIA RDI-1 System Integration Test Complete										X			(U) RSA Phase I Operational T&E											X		(U) RSA Phase I System Turnover											X	
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Complete</u>	Total <u>Cost</u>																																																																																																																																																																																																						
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Project 9222				Page 3 of 5 Pages				Exhibit R-2 (PE 0305182F)																																																																																																																																																																																																							

DATE
February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0305182F Eastern Space Launch Facility (Space)

	1	2	3	4	1	2	3	4	1	2	3	4
(U) RSA Phase IIA RDI-1 Combined DT&E and IOT&E											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305182F Eastern Space Launch Facility (Space)				PROJECT 9222	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	RSA Phase I Contract				8,776	9,542	7,498			
(U)	RSA Phase IIA Contract				23,396	21,190	15,780			
(U)	Program Support				1,728	1,286	1,300			
(U)	Total				33,900	32,018	24,578			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
<u>Performing Organizations:</u>										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligat'n Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	To Complete	Total Program
Product Development Organizations										
Harris Corp/ Loral (RSA Phase I)	C/CPAF	Jun 93	93,859	93,859	69,571	8,776	9,542	7,498	0	93,859
Lockheed Martin (RSA Phase IIA)	C/CPAF	Nov 95	166,521	166,521	9,800	23,396	21,190	15,780	96,355	166,521
Harris Corp. (ROCC Eng'r Services)	SS/CPAF	Apr 94	23,852	23,852	23,852	0	0	0	0	23,852
Various (Other RSA)	Various	Various	N/A	N/A	2,913	0	0	0	0	2,913
Support and Mangement Organizations										
Mission Support	Various	Various	N/A	N/A	10,021	1,728	1,286	1,300	Cont.	Cont.
Project 9222					Page 4 of 5 Pages			Exhibit R-3 (PE 0305182F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE
BUDGET ACTIVITY										February 1998
7 - Operational System Development					PE NUMBER AND TITLE					PROJECT
					0305182F Eastern Space Launch Facility (Space)					9222
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligat'n Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	To Complete	Total Program
Test and Evaluation Organizations										
TBD	TBD	1998	N/A	N/A	0	0	0	0	TBD	TBD
Government Furnished Property: RSA Phase IIA contract awarded Nov 95; process underway to identify GFE										
Subtotal Product Development					106,136	32,172	30,732	23,278	96,355	287,145
Subtotal Support and Management					10,021	1,728	1,286	1,300	Cont.	Cont.
Subtotal Test and Evaluation					N/A	N/A	N/A	N/A	N/A	N/A
Total Project					116,157	33,900	32,018	24,578	Cont.	Cont.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305205F Endurance UAVs	PROJECT 4755
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	Cost to Complete	Total Cost
4755 Predator UAV	0*	14,147	4,307	4,076	3,800	3,883	3,960	0	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

* In FY 1997, \$7,777M was included in DARP PE0305205D for Predator.

(U) A. Mission Description and Budget Item Justification

The Predator unmanned aerial vehicle (UAV) was an Advanced Concept Technology Demonstration (ACTD) project funded in PE 0305154D for the development of an endurance UAV capable of sustained (long dwell) surveillance of critical targets, under most weather conditions, at a range of 500 nm from the launch area. The Predator is equipped with Electro-Optical/Infra-Red (EO/IR) and Synthetic Aperture Radar (SAR) sensors. The system also incorporates line-of-sight(LOS), narrow-band UHF SATCOM and wide-band Ku-band SATCOM datalinks capable of providing near-real-time (NRT) transmission of high resolution imagery throughout the operational envelope. The system supports the theater commander and interfaces with the Command, Control, Communication, Computer and Intelligence (C4I) architecture. The Predator is integral to the search and destruction of Critical Mobile Targets (CMT). The success of the Predator in a number of exercises and operational deployments in Bosnia has prompted the Joint Requirements Oversight Council (JROC) to request an additional quantity of systems and sensors. The JROC has identified a number of P3I upgrades (de-icing, UHF/VHF voice relay, and IFF Mode IV) to be included with production systems. IR sensor improvements and growth payloads are being considered. UAV Common Automated Recovery System (UCARS) has been added by Congress. This program is in budget activity 7, Operational Systems Development, because it involves follow-on Air Force R&D to make it a viable system.

(U) FY 1997 (\$ in Thousands):

- (U) 0 Total - Funds included in DARP PE 0305205D

(U) FY 1998 (\$ in Thousands):

- (U) \$1070 Complete VOX/IFF/De-ice
- (U) \$2000 Conduct operational tests/operational assessment
- (U) \$2660 Other P3I (accuracy, acoustics, NBC assessment...)
- (U) \$1000 Improve operational capabilities of Ku SATCOM
- (U) \$1200 Improve system R&M to meet ORD requirements
- (U) \$5800 Integrate UAV Common Automatic Recovery System (UCARS)
- (U) \$ 417 Field support
- (U) \$14147 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305205F Endurance UAVs	PROJECT 4755																																																		
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$1050 Conduct operational tests/operational assessment - (U) \$ 500 Develop interfaces to Theater Deployable Communications (TDC) - (U) \$ 940 Other P3I (accuracy, acoustics, NBC assessment...) - (U) \$ 900 Improve operational capabilities of Ku SATCOM - (U) \$ 500 Improve system R&M to meet ORD requirements - (U) \$ 417 Field support - (U) \$4307 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget</td> <td align="center">0</td> <td align="center">0</td> <td align="center">0</td> <td align="center">0</td> </tr> <tr> <td>(U) Appropriated Value</td> <td></td> <td align="center">14,990</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Reductions</td> <td></td> <td align="center">-489</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td></td> <td align="center">-354</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Year Since 98PB</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td align="center">0</td> <td align="center">14,147</td> <td align="center">4,307</td> <td align="center">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="margin-left: 40px;">Funding: FY98 funds requested under PE 0305205D but appropriated under PE 0305205F</p> <p style="margin-left: 40px;">Schedule: Funding changes have necessitated a restructure of Block I upgrades (FY98), deferring contract to FY00/01</p> <p style="margin-left: 40px;">Technical: None</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget	0	0	0	0	(U) Appropriated Value		14,990			(U) Adjustments to Appropriated Value					a. Cong Reductions		-489			b. SBIR		-354			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					(U) Adjustments to Budget Year Since 98PB					(U) Current Budget Submit/FY 1999 President's Budget	0	14,147	4,307	TBD
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																
(U) Previous President's Budget	0	0	0	0																																																
(U) Appropriated Value		14,990																																																		
(U) Adjustments to Appropriated Value																																																				
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c. Omnibus or Other Above Threshold Reprogram																																																				
d. Below Threshold Reprogramming																																																				
(U) Adjustments to Budget Year Since 98PB																																																				
(U) Current Budget Submit/FY 1999 President's Budget	0	14,147	4,307	TBD																																																
Project 4755	Page 2 of 5 Pages	Exhibit R-2 (PE 0305205F)																																																		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305205F Endurance UAVs	PROJECT 4755
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>
(U) Aircraft Procurement, AF (PE 35205F)	104832	138340	117961	43017	26777	52345*	78070*	continues	continues
(U) Other Procurement, AF (PE 27245F)	2858								
(U) MILCON, AF (PE 27245F)	4690		15013						
(U) O&M, AF (PE 27245F)**	7440	18188	25988	30489	29382	31867	30959	continues	continues
(U) Other Procurement, Navy	5600								

* Includes HAE UAV procurement funds
 ** Includes UAV Battle Lab funds starting in FY99

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1
(U) Production Rate Verification Start				*					
(U) TEMP approval					X				
(U) OT&E								X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305205F Endurance UAVs			PROJECT 4755		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Hardware/Software				2162	4350	1620			
(U)	Demonstrations and test				2685	4690	1140			
(U)	System integration and logistics support				1526	4110	990			
(U)	Other technical/engineering				1109	997	557			
(U)	DARP integration and support				295					
(U)	Total				7777	14147	4307			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
General Atomics	SS/CPFF	Apr 98	N/A	N/A		2615	12702	3050	continuing	continuing
L3 Com	SS/CPFF	Apr 98	N/A	N/A		969	0	0	0	969
Misc		Dec 97	N/A	N/A		218	0	0	0	218
<u>Support and Management Organizations</u>										
NAWC								417	continuing	continuing
AD/NAVAIR						374	320			
Misc						792				
US ArmyMissile Command						1600				
Project 4755					Page 4 of 5 Pages			Exhibit R-3 (PE 0305205F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305205F Endurance UAVs					PROJECT 4755
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Test and Evaluation Organizations</u>										
AFOTEC						480	795	840	continuing	continuing
NAWC,WD						293				
Misc						436	330			
(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)										
Government Furnished Property:										
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date		Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Property</u>										
N/A										
<u>Support and Management Property</u>										
N/A										
<u>Test and Evaluation Property</u>										
N/A										
Subtotal Product Development						3802	12702	3050	continuing	continuing
Subtotal Support and Management						2766	320	417	continuing	continuing
Subtotal Test and Evaluation						1209	1125	840	continuing	continuing
Total Project						7777	14147	4307	continuing	continuing
Project 4755										

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305207F Manned Reconnaissance	PROJECT 4754
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4754 COBRA BALL Field Laser Demo (FLD)	0	11,360	0	0	0	0	0	0	11,360
Quantity of RDT&E Articles	0	0	0	1	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

(U) This project supports design studies, engineering analysis, non-recurring engineering, and other efforts associated with modifications to the RC-135 or its mission systems. The results of these efforts provide the requisite engineering necessary to implement modifications or provide a preliminary assessment of the technical feasibility, operability, or general military utility of an application. This particular project develops and evaluates a Laser Ranging and Imaging system for the COBRA BALL platform.

(U) This Congressionally directed project continues the effort funded by Congress in FY97 through the design and fabrication of an Advanced Airborne Sensor (AAS) based upon previous technology developed under the Field Laser Demonstration program (PE 0305154F BPAC 4607, Congressional plus up), and produces aircraft integration design data.

(U) COBRA BALL AAS is in Budget Activity 7, Operational System Development. It involves integration of off-the-shelf technology into fielded (operational) systems.

(U) Acquisition Strategy:

(U) The RC-135 sustainment and modification activities are managed by the Air Force through the BIG SAFARI program. Only the Air Force Acquisition Executive, SAF/AQ, may assign programs to BIG SAFARI. These projects are managed by a single Air Force Material Command (AFMC) organization, ASC/RAB. ASC/RAB provides technical oversight and management of all aircraft, ground and support system modifications, integration and flight test engineering responsibility, product assurance and acceptance testing, and logistics and training activities.

(U) FY 1997 (\$ in Thousands):

– (U) \$0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305207F Manned Reconnaissance	PROJECT 4754
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(U) FY 1998 (\$ in Thousands):

- (U) \$2,970 Prototype Design
- (U) \$320 Simulation and Analysis
- (U) \$230 Aircraft Integration
- (U) \$250 Range-In-A-Box (testing tool)
- (U) \$5,460 Sensor Build and Ground Test
- (U) \$540 System Integration Test
- (U) \$110 Range-In-A-Box Test
- (U) \$1,480 System Integration/Program Administration
- (U) \$11,360 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Total

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget* (FY 1998PB)	0	0	0	0
(U) Appropriated Value	0*	12,000		12,000
(U) Adjustments to Appropriated Value				
a. Cong Reductions	0	-393		
b. SBIR	0	-247		
c. Omnibus or Other Above Threshold Reprogram	0	0		
d. Below Threshold Reprogramming	0	0		
(U) Adjustments to Budget Years Since FY 1998 PB	0	0	0	
(U) Current Budget Submit/FY 1999 President's Budget	0	11,360	0	11,360

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305207F Manned Reconnaissance	PROJECT 4754
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(U) Change Summary Explanation:
 Funding: FY97 \$5M Congressional add started program in PE 0305154F BPAC 4607

Schedule: Not Applicable

Technical: Not Applicable

(U) **C. Other Program Funding Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>
(U) Not Applicable									

(U) **D. Schedule Profile**

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Preliminary Design Review									X			
(U) Critical Design Review										X		
(U) Prototype Delivery (Q1 FY00)*												

*Congress provided lump sum as an add on in FY1998 to complete a prototype. Congressionally directed tasks require 18 months to complete. All funds will be obligated in FY98.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305207F Manned Reconnaissance	PROJECT 4754
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) System Design and Analysis	0	3,290	0
(U) Fabrication and Test	0	6,360	0
(U) Integration and Support	0	1,710	0
(U) Total	0	11,360	0

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Product Development Organizations (FY97 activity was in PE 0305154F BPAC 4607)

ASC/RAB	Multiple	Aug 97	4,750	4,750	0	4,750	11,360	0	0	16,110
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Support and Management Organizations

N/A

Test and Evaluation Organizations

N/A

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305207F Manned Reconnaissance			PROJECT 4754		
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>									
Government Furnished Property: None									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
N/A									
<u>Support and Management Property</u>									
N/A									
<u>Test and Evaluation Property</u>									
N/A									
Subtotal Product Development				0	11,360	0	0	0	16,110
Subtotal Support and Management				0	0	0	0	0	0
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				0	11,360	0	0	0	16,110
Project 4754									

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	26,717	6,726	7,878	4,607	4,252	3,776	3,792	Continuing	Continuing
3880 CMU	12,884	548	118	0	0	0	0	0	1,291,980
3881 Integrated TW/AA	9,079	4,761	6,736	4,607	4,252	3,776	3,792	Continuing	Continuing
4409 Legacy Interfaces	4,754	1,417	1,024	0	0	0	0	0	47,602
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program element funds the replacement systems for the Cheyenne Mountain Complex (CMC) which provides the Command, Control, Communications and Computers (C4) in support of the Integrated Tactical Warning/Attack Assessment (Integrated TW/AA) system. This program incrementally upgrades and replaces the current operational systems without loss of attack warning capability during the phased transition. The CMC supports the Commander-in-Chief (CINC) North American Aerospace Defense Command (NORAD)/CINC US Space Command in providing the National Command Authorities, USSTRATCOM and other forward users with early warning (missile, air, and space) and assessment of attack on North America or its allies.

This program element has three related projects: The first project, Cheyenne Mountain Upgrade (CMU), is six acquisitions that are supported by both the second and third project. The second project, Integrated TW/AA System Engineering, provides interface analysis and disconnect resolution between CMU and over twenty other Integrated TW/AA systems and future program upgrades and supports the development of the Cheyenne Mountain Training System (CMTS). The third project, Legacy Interfaces, provides software development upgrades to post-IOC CMU subsystems and direct mission software support to meet operational needs.

This program element is in Budget Activity 7, Operational System Development, because the projects in this program element support development acquisition programs or upgrades.

(U) Acquisition Strategy:

The CMU program was restructured in FY94 to implement an acquisition strategy that tests and delivers four phases of user capability. Phase 1 implemented the complete missile warning capability in Sep 95. Phase 2 operational acceptance occurred in August 1996. Phase 3 operational acceptance occurred in July 1997. Phase 4 will be operationally accepted in August 1998. The CMU Integrated Mission IOT&E will be completed by Mar 1999.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems					
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>					
(U) Previous President's Budget (FY1998 PB)	29,466	7,362	5,036	Continuing					
(U) Appropriated Value	31,692	7,362							
(U) Adjustments to Appropriated Value									
a. Cong Gen Reductions	-1,446	-480							
b. SBIR	-780	-156							
c. Omnibus or Other Above Threshold Reprogram									
d. Below Threshold Reprogramming	-2,700								
e. Recisions	-49								
(U) Adjustments to Budget Years Since FY 1998 PB			2,842						
(U) Current Budget Submit (FY1999 President's Budget)	26,717	6,726	7,878	Continuing					
(U) Change Summary Explanation:									
Funding: FY 97 Below Threshold Reprogramming (BTR) to higher priority Air Force program. FY99 adjustment to fund CSAF - directed AF Long Range Plan (AF LRP) jump start initiative for Space Command and Control (C2) prototyping. This effort will generate different options to migrate current Space C2 applications to the Defense Information Infrastructure Common Operating Environment (COE).									
Schedule: No change.									
Technical: No change.									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
(U) Other Procurement (Electronics and tele-communications equipment/BA04/PE0305906F)*	4,481	8,758	12,722	4,621	12,820	11,842	10,826	Compl	Cost
(U) Operations & Maintenance (PE0305906F)	98,207	92,629	91,910	89,216	95,318	99,186	100,821	Cont	Cont
* Includes spares for CMU and Space Mobile Consolidated Command Center (MCCC) modifications.									
<u>Related RDT&E:</u>									
(U) 604441F, Space-Based Infrared System									
(U) 305910F, Spacetrack									
(U) 305911F, Defense Support Program									

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Air Warning Mission Operational Acceptance			X									
(U) CMU Phase 3 Operational Acceptance				X								
(U) Space Control Mission Operational Acceptance							X					
(U) CMU Phase 4 Operational Acceptance							X					
(U) CMU Integrated Mission IOT&E										X		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 3880
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3880 CMU	12,884	548	118	0	0	0	0	0	1,291,980

(U) A. Mission Description and Budget Item Justification

The CMU program must meet Joint Chiefs of Staff (JCS) requirements to provide the National Command Authorities with timely, reliable, and unambiguous Integrated TW/AA data for force survival or retaliatory decisions in the face of air, space, or ballistic missile threats. The program will provide: 1) survivable communications access for missile attack warning; 2) integrated warning of ballistic missile, atmospheric, and space threats; 3) standard user displays and warning processing systems at selected command centers; 4) an austere alternate facility capable of early/trans-attack warning and peacetime backup to the Missile Warning Center at Cheyenne Mountain. The CMU program implements an acquisition strategy that tests and delivers four phases of user capability. Phase 1 implemented the missile warning capability in Sept 1995. Phases 2 and 3 were completed in August 1996 and July 1997, respectively. Phase 4 will be operationally accepted in August 1998. The CMU Integrated Mission IOT&E will be completed by Mar 1999.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997 (\$ in thousands)

- (U) \$5,224 Completed Phase 3 (July 97) with operational acceptance of Granite Sentry and Missile Warning remote capability
- (U) \$6,764 Continued Phase 4, Space Defense Operations Center (SPADOC) 4C version 2 interface development with the Communications System Segment Replacement (CSSR)
- (U) \$896 Completed Missile Warning IOT&E residuals and delivered Survivable Secure Communications Network (SSCN) Phase 2 (Feb 97)
- (U) \$12,884 Total

(U) FY 1998 (\$ in thousands)

- (U) \$548 Complete CMU Phase 4 and Space Control Mission Operational Acceptance
- (U) \$548 Total

(U) FY 1999 (\$ in thousands)

- (U) \$118 Complete CMU Integrated Mission IOT&E
- (U) \$118 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 3880
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(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>
(U) Previous President's Budget (FY 1998 PB)	16,010	603	120	1,297,524
(U) Appropriated Value	21,375	603		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-1231	-55		
b. SBIR	-780			
c. Below Threshold Reprogramming	-2,700			
d. Omnibus or Other Above Threshold Reprogram				
e. Rescissions	-49			
f. Other (Project Realignment)	-3,731			
(U) Adjustments to Budget Years Since FY 1998 PB			-2	
(U) Current Budget Submission (FY1999 President's Budget)	12,884	548	118	1,291,980

(U) **Change Summary Explanation (\$ in Thousands):**

Funding: FY97 realignment (-3,731) to project 3881 (+3,633) and project 4409 (+98).

Schedule: No change.

Technical: No change

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 3880
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
Other Procurement (Electronics and tele-communications equipment/BA04/PE0305906F)*	4,481	8,758	12,722	4,621	12,820	11,842	10,826	Cont	Cont
(U) Operations & Maintenance (PE0305906F)	98,207	92,629	91,910	89,216	95,318	99,186	100,821	Cont	Cont

* Includes spares for CMU and Space Mobile Consolidated Command Center (MCCC).

(U) D. Schedule Profile

	<u>FY1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Air Warning Mission Operational Acceptance			X									
(U) CMU Phase 3 Operational Acceptance				X								
(U) Space Control Mission Operational Acceptance							X					
(U) CMU Phase 4 Operational Acceptance							X					
(U) CMU Integrated Mission IOT&E										X		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 3880
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(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Major Contract Incremental Funding	636		
(U) Award/Performance Fee	29		
(U) Target To Ceiling/Overrun	346		
(U) ECPs/Correction of Deficiencies/Incomp	219		
(U) Interoperability/Test Support	452		
(U) Tech Manuals	4		
(U) SPO Support			
(U) MITRE	5,063		
(U) TEMS/SDAS/WSI/SAIC/NSR	4,179		
(U) Program Support	1,956	548	118
(U) Other Support	0		
(U) Total	12,884	548	118

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems				PROJECT 3880	
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Lockheed-Martin CO Springs CO	C/CPIF/AF	Oct 91	72,300	72,300	271,669	145	0	0	0	271,814
E-Systems St Petersburg FL	C/FPI/AF	Aug 86	107,000	106,500	103,240	0	0	0	0	103,240
TRW, Inc Carson CA	C/FPI/AF	Jun 87	172,600	172,600	213,761	0	0	0	0	213,761
GTE Needham Hgts MA	C/CPIF/AF	Jan 92	16,500	16,500	238,063	352	0	0	0	238,415
Lockheed-Martin CO Springs CO	SS/CPIF/AF	Mar 93	41,300	41,300	119,713	305	0	0	0	120,018
DISA (Govt) Reston VA	PO	Oct 93	9,092	9,092	9,092	60	0	0	0	9,152
KAMAN Sciences CO Springs CO	AF616/C	Aug 95	3,176	3,176	3,176	0	0	0	0	3,176
Misc	Various	Various	820	820	0	820	0	0	0	820
<u>Support and Management Organizations</u>										
MITRE	SS/PR	Oct 95	N/A	N/A	163,497	5,063	0	0	0	168,560
TEMS	C/PR	Oct 95	N/A	N/A	68,636	4,179	0	0	0	72,815
Program Support	Various	Nov 95	N/A	N/A	87,583	1,960	548	118	0	90,209
<u>Test and Evaluation Organizations</u>										
N/A										
Project 3880					Page 8 of 16 Pages			Exhibit R-3 (PE 0305906F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 3881
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3881 Integrated TW/AA	9,079	4,761	6,736	4,607	4,252	3,776	3,792	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

This project was set up in 1989 when Air Force recognized the phased transition of CMU program into the Integrated TW/AA network could only be achieved through rigorous system-of-systems design and engineering analysis of all interfaces and relationships among the twenty-six systems of the network. This project provides for the efficient integration of CMU through interface analysis, schedule management and disconnect resolution between CMU and over twenty other Integrated TW/AA systems and future program upgrades as required to support the Integrated TW/AA network's continually evolving system-of-systems (e.g., Space-Based Infrared System) and changes driven by new missions/threats.

(U) Acquisition Strategy:
All major contracts within this Program Element were awarded after full and open competition

(U) FY 1997

- (U) \$6,772 Systems Engineering Integration (SEIT): Provided operation integration of CMU Phase 3 installation, check-out, test and assessment; maintained program schedule; identified, tracked and resolved CMU disconnects
- (U) \$2,307 Technical Performance Engineering (TPE): Maintained CMU technical baseline; evaluated performance and tracked to prescribed requirements; provided system engineering for Phase 3, and accomplished systems engineering studies for proposed ITW/AA system improvements.
- (U) \$9,079 Total

(U) FY 1998

- (U) \$2,115 SEIT: Provide operation integration of CMU Phase 4 installation, check-out, test and assessment; maintain program schedule; identify, track and resolve disconnects within the ITW/AA system.
- (U) \$2,646 Future Plans: Manages planned incremental capability modifications to NCMC-TW/AA systems.
- (U) \$4,761 Total

(U) FY 1999

- (U) \$1,703 SEIT: Integrated Mission IOT&E for CMU Phase 3
- (U) \$2,168 Future Plans: Manages planned incremental capability modifications to NCMC-TW/AA systems.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 3881																																																							
<p>– (U) \$2,865 AF long range planning “jump start” funding for command and control prototyping</p> <p>– (U) \$6,736 Total</p> <p>SEIT, TPE, and Future Plans are stand alone contracts</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1997</th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1998</th> <th style="text-align: center; border-bottom: 1px solid black;">FY 1999</th> <th style="text-align: center; border-bottom: 1px solid black;">Total</th> </tr> </thead> <tbody> <tr> <td>(U) Previous President’s Budget (FY 1998 PB)</td> <td style="text-align: center;">8,800</td> <td style="text-align: center;">5,132</td> <td style="text-align: center;">3,871</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">5,562</td> <td style="text-align: center;">5,132</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td></td> <td style="text-align: center;">-371</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Rescissions</td> <td style="text-align: center;">-116</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Other (Project realignment)</td> <td style="text-align: center;">3,633</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">2,865</td> <td></td> </tr> <tr> <td>(U) Current Budget Submission FY1999 President’s Budget</td> <td style="text-align: center;">9,079</td> <td style="text-align: center;">4,761</td> <td style="text-align: center;">6,736</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation (\$ in Thousands): Funding: Project realignment reflects a transfer of 3,633 from project 3880 to 3881 in FY97. FY99 increase of 2,865 for CSAF - directed AF LRP “jump start” of Space C2 prototyping. Schedule: No change. Technical: No change.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> (U) Not Applicable.</p> <p>(U) D. <u>Schedule Profile</u> (U) Not Applicable. This is a sustaining engineering effort that supports project 3880 with no distinct milestones.</p>				FY 1997	FY 1998	FY 1999	Total	(U) Previous President’s Budget (FY 1998 PB)	8,800	5,132	3,871	Continuing	(U) Appropriated Value	5,562	5,132			(U) Adjustments to Appropriated Value					a. Cong Reductions		-371			b. Omnibus or Other Above Threshold Reprogram					c. Below Threshold Reprogramming					d. Rescissions	-116				e. Other (Project realignment)	3,633				(U) Adjustments to Budget Years Since FY 1998 PB			2,865		(U) Current Budget Submission FY1999 President’s Budget	9,079	4,761	6,736	Continuing
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Project 3881	Page 11 of 16 Pages	Exhibit R-2 (PE 0305906F)																																																							

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems			PROJECT 3881		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>		<u>FY 1999</u>		
(U) Command and control long range planning								2,865		
(U) Major Contract Incremental Funding					0					
(U) Award/Performance Fee					0					
(U) CMTS Systems Integration					0					
(U) Interface Control System Development										
(U) SPO Support										
(U) MITRE					4,992	4,200		3,406		
(U) TEMS/WSI					3,985	561		465		
(U) Program Support					102	0		0		
(U) Total					9,079	4,761		6,736		
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government	Contract Method/Type	Award or Obligation	Performing Activity	Project Office	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Activity</u>	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
<u>Product Development Organizations</u>										
DISA	MIPR	Apr 96	1,328	1,328	1,328	0	0	0	Cont	Cont
LORAL Aerospace Co Springs, CO	C/CPIF/AF	Jun 95	6,390	6,390	6,390	0	0	0	Cont	Cont
TBD	TBD	TBD	TBD	TBD	0	0	0	2,865	Cont	Cont
<u>Support and Management Organizations</u>										
MITRE	CPFF	Oct 95	N/A	N/A	43,985	4,992	4,200	3,406	Cont	Cont
Project 3881					Page 12 of 16 Pages			Exhibit R-3 (PE 0305906F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems				PROJECT 3881	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
TEMS	CPAF	Oct 95	N/A	N/A	27,419	3,985	561	465	Cont	Cont
Program Support	N/A	Nov 95	N/A	N/A	6,962	102	0	0	Cont	Cont
Prime Contractors	(Various)				812	0	0	0	TBD	TBD
<u>Test and Evaluation Organizations</u>										
N/A										
Government Furnished Property:										
Not Applicable.										
					Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Subtotal Product Development					7,718			2,865	Cont	Cont
Subtotal Support and Management					79,178	9,079	4,761	3,871	Cont	Cont
Subtotal Test and Evaluation										
Total Project					86,896	9,079	4,761	6,736	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 4409
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4409 Legacy Interfaces	4,754	1,417	1,024	0	0	0	0	0	47,602

(U) A. Mission Description and Budget Item Justification

The FY95 Appropriations Conference Committee transferred \$41.5M from the O&M Critical Space Contract Operations Line to the RDT&E R-1 line in this program element. Congress realigned these funds from O&M to RDT&E to identify the costs associated with CMU software development upgrades to the CMU program. To clearly account for this funding, this project, Legacy Interfaces, was established. This project provides funding for software development upgrades to the CMU program and for direct mission software support to meet operational needs.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition

(U) FY 1997

- (U) \$500 Provided SPADOC software support/upgrades
- (U) \$1,344 Provided warning system software upgrades for space, communications, and missile warning systems at Cheyenne Mountain
- (U) \$2,910 Provided Cheyenne Mountain complex test support to include scenario development and development network software engineering
- (U) \$ 4,754 Total

(U) FY 1998

- (U) \$1,417 Provide Cheyenne Mountain software engineering support/upgrades
- (U) \$1,417 Total

(U) FY 1999

- (U) \$1,024 Provide Cheyenne Mountain software engineering support/upgrades
- (U) \$1,024 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																																																																																																					
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems	PROJECT 4409																																																																																																																																					
<p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;"></th> <th style="text-align: right;"><u>FY 1997</u></th> <th style="text-align: right;"><u>FY 1998</u></th> <th style="text-align: right;"><u>FY 1999</u></th> <th style="text-align: right;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998 PB)</td> <td style="text-align: right;">4,656</td> <td style="text-align: right;">1,627</td> <td style="text-align: right;">1,045</td> <td style="text-align: right;">47,516</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">4,755</td> <td style="text-align: right;">1,627</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Gen Reductions</td> <td></td> <td style="text-align: right;">-54</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td></td> <td style="text-align: right;">-156</td> <td></td> <td></td> </tr> <tr> <td> c. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Rescissions</td> <td style="text-align: right;">-99</td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Other (Project Realignment)</td> <td style="text-align: right;">98</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustment to budget years since FY1998 PB</td> <td></td> <td></td> <td style="text-align: right;">-21</td> <td></td> </tr> <tr> <td>(U) Current Budget Submission (FY1999 President's Budget)</td> <td style="text-align: right;">4,754</td> <td style="text-align: right;">1,417</td> <td style="text-align: right;">1,024</td> <td style="text-align: right;">47,602</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation (\$ in Thousands): Funding: FY97 project realignment (+98) from project 3880. Schedule: No change. Technical: No change.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> (U) Not Applicable.</p> <p>(U) D. <u>Schedule Profile</u></p> <table style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;"></th> <th colspan="4" style="text-align: center;"><u>FY 1997</u></th> <th colspan="4" style="text-align: center;"><u>FY 1998</u></th> <th colspan="4" style="text-align: center;"><u>FY 1999</u></th> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> </tr> </thead> <tbody> <tr> <td>(U) SPADOC software support/upgrades</td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Warning systems software support/upgrades</td> <td style="text-align: center;">X</td> <td></td> </tr> <tr> <td>(U) CMC Test Support</td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) CMAS software upgrades</td> <td style="text-align: center;">X</td> <td></td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY1998 PB)	4,656	1,627	1,045	47,516	(U) Appropriated Value	4,755	1,627			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions		-54			b. SBIR		-156			c. Below Threshold Reprogramming					d. Rescissions	-99				e. Other (Project Realignment)	98				(U) Adjustment to budget years since FY1998 PB			-21		(U) Current Budget Submission (FY1999 President's Budget)	4,754	1,417	1,024	47,602		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>					1	2	3	4	1	2	3	4	1	2	3	4	(U) SPADOC software support/upgrades	X				X				X				(U) Warning systems software support/upgrades	X												(U) CMC Test Support	X				X				X				(U) CMAS software upgrades	X											
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Project 4409	Page 15 of 16 Pages	Exhibit R-2 (PE 0305906F)																																																																																																																																					

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305906F NCMC-TW/AA Systems				PROJECT 4409	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Major Contract Incremental Funding					4,279					
(U) Award/Performance Fee					475					
(U) Total Legacy Interfaces Project					4,754	1,417	1,025			
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Lockheed-Martin CO Springs CO	CP/AF	Oct 94	12,024	12,024	8,852	500	0	0	0	9.352
E-Systems St Petersburg FL	FPIF/AF	Oct 94	1,880	1,880	1,880	0	0	0	0	1,880
Kaman Sciences CO Springs CO	CP/AF	Oct 94	18,166	18,166	15,304	2,910	0	0	0	18,214
Kaman Sciences CO Springs CO	CP/AF	Oct 94	12,520	12,520	11,127	1,344	0	0	0	12,471
Navy/NISE	MIPR	Sep 95	3,244	3,244	3,244	0	0	0	0	3,244
<u>Support and Management Organizations:</u> TBD							1,417	1,024		2,441
<u>Test and Evaluation Organizations:</u> N/A										
<u>Government Furnished Property:</u> N/A										
Subtotal Product Development					40,407	4,754	0	0	00	45,161
Subtotal Support and Management					0	0	1,417	1,024	0	2,441
Subtotal Test and Evaluation					0	0	0	0	0	
Total Project					40,407	4,754	1,417	1,024	0	47,602
Project 4409					Page 16 of 16 Pages			Exhibit R-3 (PE 0305906F)		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack (Space)
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<i>COST (\$ In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	32,794	38,432	39,532	28,121	0	0	0	0	260,738
4239 Air Force Maui Optical Station	6,297	0	0	0	0	0	0	0	27,413
4241 Advanced Electro Optical System (AEOS)	19,277	28,533	17,528	0	0	0	0	0	166,081
4279 Have Stare Radar	7,220	9,899	22,004	28,121	0	0	0	0	67,244
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* Note: AMOS funding combined into AEOS BPAC beginning in FY98.

(U) **A. Mission Description and Budget Item Justification**

The SPACETRACK program element represents a worldwide Space Surveillance Network (SSN) of dedicated, collateral, and contributing electro-optical, passive radio frequency (RF) and radar sensors. The SSN is tasked to provide space object identification and cataloging, satellite attack warning, timely notification to U.S. forces of satellite fly-over, space treaty monitoring, and scientific and technical intelligence gathering. The continued increase in satellite and orbital debris populations, as well as the increasing diversity in launch trajectories, non-standard orbits, and geosynchronous altitudes, necessitates continued modernization of the SSN to meet existing and future requirements and ensure their cost-effective supportability. The Image Information Processing Center and Supercomputing facility for the Air Force Maui Optical Station (AMOS), were transferred to PE 0602601F in FY92. The resources and responsibility for completing the HAVE STARE Radar System development were transferred to SPACETRACK from an intelligence program per Congressional direction in FY93. All of these projects are Budget Activity 7, Operational Systems Development, because they involve development of or modifications to operational sensor network sites.

(U) **Acquisition Strategy:**

Except for the Congressionally-directed Maui Space Surveillance System facilities expansion project, Advanced Electro Optical System (AEOS), and the HAVE STARE radar acquisition, the other projects in this Program Element are competitive sustaining engineering infrastructure support operations and maintenance efforts.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack (Space)								
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>						
(U) Previous President's Budget (FY 1998 PB)	31,851	28,573	14,147						
(U) Appropriated Value	33,867	43,073							
(U) Adjustments to Appropriated Value									
a. Cong Gen Reductions	-1,190	-3,679							
b. SBIR	-826	-962							
c. Omnibus or Other Above Threshold Reprogram	-1,000								
d. Below Threshold Reprogramming	1,996								
e. Rescission	-53								
(U) Adjustments to Budget Years Since FY 1998 PB			25,385						
(U) Current Budget Submit/FY1999 President's Budget	32,794	38,432	39,532						
(U) Change Summary Explanation:									
Funding: FY 99 adjustments - - Air Force funding increase continues the HAVE STARE project (7,857). OSD added funding for the AEOS project (17,528).									
Schedule: None.									
Technical: None.									
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement	10,692	7,181	1,829	311	3,862	3,844	3,826	Cont	Cont
(Electronic and Telecommunications Equipment (BA 63, P-68))									
<u>Related RDT&E:</u> (U) Program Element #0305906F, NORAD Cheyenne Mountain Complex Tactical Warning/Attack Assessment System of Systems.									
(U) D. <u>Schedule Profile</u>									
	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1
(U) AEOS telescope/facility									
(U) Factory acceptance/occupancy facility				X					
(U) Telescope Factory Acceptance				X					

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack (Space)
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	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Radiometer Acceptance							X					
(U) Long Wave Imager Acceptance								X				
(U) Observatory Control Sys Acceptance											X	
(U) Adaptive Optics System Acceptance												X
(U) HAVE STARE Radar												
(U) Contract Modification (due to delayed site selection decision)					X							
(U) Deinstall Test Site									X			
(U) Reinstall at Operational Site											X	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305910F Spacetrack (Space)				PROJECT 4239	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4239 Air Force Maui Optical Station	6,297	0	0	0	0	0	0	0	27,413
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0
<p>* Note: AMOS funding continues in AEOS BPAC beginning in FY98.</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u></p> <p>AMOS serves as a testbed for electro-optics and imaging technology supporting government and academic communities. It also provides operational data to Air Force Space Command: infrared signature data and compensated, imaging data used for space object identification and mission/payload assessment. Other government labs, national science foundations and other scientific agencies' use of this facility are funded separately. This project is in Budget Activity 7, Operational Systems Development, because it involves a level-of-effort for sustained engineering support for development of, or modifications to, an operational SPACETRACK network site.</p> <p>(U) <u>FY 1997</u></p> <p>– (U) \$6,297 Continued support to Maui Space Surveillance System (MSSS) R&D upgrades, development of MSSS observatory control system, and operational transition of AEOS. Single end item, funding transfers to AEOS BPAC in FY98.</p> <p>(U) <u>FY 1998</u></p> <p>– (U) \$0 Not Applicable</p> <p>(U) <u>FY 1999</u></p> <p>– (U) \$0 Not Applicable</p>									
Project 4239			Page 4 of 16 Pages			Exhibit R-2 (PE 0305910F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack (Space)			PROJECT 4239
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	6,297	0	0	27,413
(U) Appropriated Value	6,500			
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-203			
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) Current Budget Submit (FY1999 President's Budget)	6,297	0	0	27,413
 (U) Change Summary Explanation:				
Funding: Starting in FY1998, Project 4239 (AMOS) was combined with Project 4241 (AEOS).				
Schedule: None.				
Technical: None.				
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
Not Applicable.				
 (U) D. <u>Schedule Profile</u>				
Not Applicable.				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY					PE NUMBER AND TITLE					PROJECT
7 - Operational System Development					0305910F Spacetrack (Space)					4239
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Level of effort support					6,297	0	0			
(U) Total					6,297	0	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Contractor or Government	Contract Method/Type	Award or Obligation Date	Performing Activity	Project Office	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Activity</u>	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Complete</u>	<u>Program</u>
<u>Product Development Organizations</u>										
RTS, Kihei, HI	C/CPAF/AF	Dec 95	N/A	N/A`	4,610	4,672	0	0	0	9,282
RPS, Kihei, HI	C/CPAF/AF	Oct 90	N/A	N/A	12,610	0	0	0	0	12,610
<u>Support and Management Organizations</u>										
W. J. Schafer	C/CPFF	Feb 92	N/A	N/A	136	94	0	0	0	230
Albuquerque, NM										
S Systems Corp	C/CPFF	Jul 93	N/A	N/A	132	0	0	0	0	132
Albuquerque, NM										
Program Support	Various				3,628	1,531	0	0	0	5,159
<u>Test and Evaluation Organizations</u> Not Applicable										
Government Furnished Property: Not Applicable.										
Subtotal Product Development					17,220	4,672	0	0	0	21,892
Subtotal Support and Management					3,896	1,625	0	0	0	5,521
Subtotal Test and Evaluation					0	0	0	0	0	0
Total					21,116	6,297	0	0	0	27,413

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305910F Spacetrack (Space)				PROJECT 4241				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4241	Advanced Electro Optical System (AEOS)			19,277	28,533	17,528	0	0	0	0	0	166,081
	Quantity of RDT&E Articles			0	0	0	0	0	0	0	0	0

*Note: FY98 funding includes AMOS efforts (AMOS funds transferred to AEOS BPAC for FY98).

(U) **A. Mission Description and Budget Item Justification**
 The Advanced Electro-Optical System (AEOS) is a 3.67 meter telescope addition to the Air Force Maui Optical Station (AMOS). The AEOS program was initiated in FY91 per Congressional direction. Congress continued to appropriate funding for this project in FY93, FY94, FY95, FY96, and FY 97. The Air Force budgeted for the continuation of AEOS in FY 97 and FY 98. This project is in Budget Activity 7, Operational Systems Development, because it involves sustained engineering support for development of, or modifications to, an operational SPACETRACK network site.

(U) **Acquisition Strategy:**
 Except for the Congressionally-directed Maui Space Surveillance System facilities expansion project, Advanced Electro Optical System (AEOS), and the HAVE STARE radar acquisition, the other projects in this Program Element are competitive sustaining engineering infrastructure support operations and maintenance efforts.

(U) FY 1997:

- (U) \$11,297 Continue telescope development incremental funding.
- (U) \$6,280 Continue atmospheric characterization studies, spectrograph research, development of adaptive optics system, and sensors development.
- (U) \$1,700 Continue Spectrograph research
- (U) \$19,277 Total

(U) FY 1998

- (U) \$17,048 Continue development of adaptive optics, sensors, and integration of the telescope system, ,
- (U) \$1,385 Purchase pre-operational spares
- (U) \$4,800 continue development of AEOS and MSSS observatory control system, and.
- (U) \$5,300 R&D upgrades to MSSS
- (U) \$28,533 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																																																				
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack (Space)	PROJECT 4241																																																																																				
<p>(U) <u>FY 1999</u></p> <ul style="list-style-type: none"> - (U) \$12,665 Continue integration of Adaptive Optics System and operational transition of AEOS - (U) \$1,565 Complete the MSSS Observatory Control System - (U) \$3,298 R&D upgrades to the MSSS - (U) \$17,528 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;">Total <u>Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">20,281</td> <td style="text-align: right;">23,800</td> <td style="text-align: right;">0</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">21,927</td> <td style="text-align: right;">31,300</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Gen Reductions</td> <td style="text-align: right;">-820</td> <td style="text-align: right;">-2,053</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-826</td> <td style="text-align: right;">-714</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming *</td> <td style="text-align: right;">-4</td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> f. Other</td> <td style="text-align: right;">-1,000</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: right;">17,528</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit (FY1999 President's Budget)</td> <td style="text-align: right;">19,277</td> <td style="text-align: right;">28,533</td> <td style="text-align: right;">17,528</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: Congress added 7,500 in FY98 for development of and modifications to the operational sensor network site. OSD budgeted for project continuation in FY99.</p> <p style="padding-left: 40px;">Schedule: Facility delays due to weather impacts/dome installation. Delays in sensor delivery due to subcontractor delivery and technical problems.</p> <p style="padding-left: 40px;">Technical: None.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>FY 2000</u></th> <th style="text-align: center;"><u>FY 2001</u></th> <th style="text-align: center;"><u>FY 2002</u></th> <th style="text-align: center;"><u>FY 2003</u></th> </tr> </thead> <tbody> <tr> <td>Other Procurement,</td> <td style="text-align: right;">10,692</td> <td style="text-align: right;">7,181</td> <td style="text-align: right;">1,829</td> <td style="text-align: right;">311</td> <td style="text-align: right;">3,862</td> <td style="text-align: right;">3,844</td> <td style="text-align: right;">3,826</td> </tr> <tr> <td colspan="8">(Electronics and Telecommunications Equipment (BA 63, P-68))</td> </tr> </tbody> </table> <p><u>Related RDT&E:</u> (U) Program Element #0305906F, NORAD Cheyenne Mountain Complex Tactical Warning/Attack Assessment System of Systems.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>	(U) Previous President's Budget (FY 1998 PB)	20,281	23,800	0	TBD	(U) Appropriated Value	21,927	31,300			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions	-820	-2,053			b. SBIR	-826	-714			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming *	-4				e. Rescissions					f. Other	-1,000				(U) Adjustments to Budget Years Since FY 1998 PB			17,528		(U) Current Budget Submit (FY1999 President's Budget)	19,277	28,533	17,528	TBD		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	Other Procurement,	10,692	7,181	1,829	311	3,862	3,844	3,826	(Electronics and Telecommunications Equipment (BA 63, P-68))							
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	Total <u>Cost</u>																																																																																		
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Project 4241	Page 8 of 16 Pages	Exhibit R-2 (PE 0305910F)																																																																																				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack (Space)	PROJECT 4241
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(U) D. <u>Schedule Profile</u>	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) AEOS telescope/facility												
(U) Factory acceptance/occupancy facility				X								
(U) Telescope Factory Acceptance				X								
(U) Radiometer Acceptance							X					
(U) Long Wave Imager Acceptance								X				
(U) Observatory Control Sys Acceptance										X		
(U) Adaptive Optics System Acceptance												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305910F Spacetrack (Space)				PROJECT 4241		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U)	Directed level of effort for AEOS Maui facilities expansion			20,277	23,800	0				
(U)	Total			20,277	23,800	0				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contract or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organization</u>										
Kiewit Pacific Co Kapolei, HI	C/FFP/AF	Aug 94	21,000	21,302	20,249	1,053	0	0	0	21,302
Contraves USA Pittsburgh, PA	C/FFP/AF	Dec 91	23,000	23,618	21,741	1,192	685	0	0	23,618
HDOS Danbury, CT	C/CPAF/AF	Aug 94	31,000	37,368	11,592	7,596	10,015	8,165	0	37,368
COMSAT RSI, Inc Clarksburg, MD	C/FFP/AF	Aug 95	7,000	7,250	6,498	752	0	0	0	7,250
Mission Research Corp Santa Barbara, CA	C/CPIF/AF	Jul 95	4,000	5,085	3,314	696	850	225	0	5,085
Hughes Aircraft Co El Segundo, CA	C/CPIF/AF	Sep 95	5,000	6,804	3,278	667	2,664	195	0	6,804
RTS Kihei, Maui, HI	C/CPAF/AF	Sep 95	N/A	24,569	2,906	3,050	10,945	6,668	0	23,569
RPS Kihei, Maui, HI	C/CPAF/AF	Oct 90	N/A	12,933	12,933	0	0	0	0	12,933
UH Maui, HI	C/CR/AF	Oct 96	3,400	1,700	0	1,700*	0	0	0	1,700
Project 4241				Page 10 of 16 Pages				Exhibit R-3 (PE 0305910F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305910F Spacetrack (Space)				PROJECT 4241	
Contract or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
*Congressional directed Spectrograph Research										
<u>Support and Management Organizations</u>										
Logicon RDA Albuquerque, NM	C/CPAF/AF	Oct 95	N/A	N/A	1,177	700	580	250	TBD	2,707
Logicon RDA Albuquerque, NM	C/CPAF/AF	Oct 93	N/A	N/A	3,360	0	0	0	TBD	3,360
MIT/LL Cambridge, MA	SS	Oct 93	N/A	N/A	2,066	200	300	300	TBD	2,866
S. Systems Corp Albuquerque, NM	C/CPFF/AF	Jul 93	N/A	N/A	2,976	0	0	0	TBD	2,976
ARMY COE Haleakala, Maui, HI	SS	Jan 95	N/A	N/A	1,225	392	0	0	TBD	1,617
WJS Albuquerque, NM	SS	Oct 97	N/A	N/A	N/A	0	259	150	TBD	409
Program Office	Various	N/A	N/A	N/A	7,428	1,279	2,235	1,575	TBD	12,517
<u>Test and Evaluation Organizations</u>										
N/A										
<u>Government Furnished Property:</u>										
N/A										
Subtotal Product Development					82,511	16,706	25,418	15,2530	TBD	125,635
Subtotal Support and Management					18,232	2,571	3,115	2,275	TBD	26,193
Subtotal Test and Evaluation					0	0	0	0	0	0
Total					100,743	19,277	28,533	17,528	TBD	166,081

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305910F Spacetrack (Space)				PROJECT 4279	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4279 Have Stare Radar	7,220	9,899	22,004	28,121	0	0	0	0	67,244
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0
<p>(U) A. Mission Description and Budget Item Justification The HAVE STARE radar was transferred from the intelligence budget in FY93 at the direction of Congress. The Air Force has identified a requirement for the HAVE STARE system and has programmed funding in this program element to complete development and to deploy the system. The HAVE STARE radar is a high resolution X-band tracking and imaging radar with a 27 meter mechanical dish antenna. The HAVE STARE system will be deployed as a dedicated space surveillance sensor to support the mission of space object catalog maintenance of deep space objects and mission payload assessment. The HAVE STARE system will retain its original design features and their inherent potential to support other missions. While at the Vandenberg AFB test site, HAVE STARE will support NMD X-band radar technology studies, hardware prototyping and demonstrations. This system is currently in the EMD phase leading to an IOC in FY00.</p> <p>(U) Acquisition Strategy: Except for the Congressionally-directed Maui Space Surveillance System facilities expansion project, Advanced Electro Optical System (AEOS), and the HAVE STARE radar acquisition, the other projects in this Program Element are competitive sustaining engineering infrastructure support operations and maintenance efforts.</p> <p>(U) <u>FY 1997</u></p> <ul style="list-style-type: none"> - (U) \$4,746 Continued in-CONUS developmental and integration testing and evaluation at Vandenberg AFB, CA. - (U) \$1,474 Continued site preparation at classified operational deployment location. - (U) \$1,000 Congressionally approved Omnibus source. - (U) \$7,220 Total <p>(U) <u>FY 1998</u></p> <ul style="list-style-type: none"> - (U) \$2,400 Continue radar development incremental funding. - (U) \$1,614 Continue preparations for deployment - (U) \$5,885 Conduct X-band radar technology prototyping, studies, and demonstrations - (U) \$9,899 Total <p>(U) <u>FY 1999</u></p> <ul style="list-style-type: none"> - (U) \$2,200 Continue radar development incremental funding. 									
Project 4279			Page 12 of 16 Pages				Exhibit R-2 (PE 0305910F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack (Space)	PROJECT 4279		
<ul style="list-style-type: none"> - (U) \$5,000 Continue facility preparations - (U) \$12,804 Deploy and re-install program equipment - (U) \$2,000 Logistics and training - (U) \$22,004 Total 				
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	5,273	4,773	14,147	*
(U) Appropriated Value	5,440	11,773		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions		-1,626		
b. SBIR	-167	-248		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming **	2,000			
e. Rescissions	-53			
(U) Adjustments to Budget Years Since FY 1998 PB			7,857	
(U) Current Budget Submit (FY1999 President's Budget)	7,220**	9,899	22,004	*
* Complete prior year data not available; program transferred from the intelligence budget in FY93 at the direction of Congress.				
** Total includes \$1.000M approved by Congress as an Omnibus source.				
 (U) Change Summary Explanation:				
<p>Funding: 2,000 was reprogrammed into this PE in FY97 to fund the Space Surveillance modification effort. Congress added 7,000 in FY98 for NMD testing (X-Band radar technology studies, prototyping and demonstration). FY99 increase funds additional site preparation costs.</p> <p>Schedule: Project delayed due to delay in overseas site selection and previously withheld funding.</p> <p>Technical: Development delayed due to withheld funding based on delayed siting decision.</p>				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>				
(U) None.				
<u>Related RDT&E:</u> (U) Program Element #0305906F, NORAD Cheyenne Mountain Complex Tactical Warning/Attack Assessment System of Systems.				
Project 4279 Page 13 of 16 Pages Exhibit R-2 (PE 0305910F)				

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305910F Spacetrack (Space)	PROJECT 4279
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
HAVE STARE Radar												
(U) Contract Modification (due to delayed site selection decision)	X											
(U) Deinstall Test Site									X			
(U) Reinstall at Operational Site											X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305910F Spacetrack (Space)			PROJECT 4279		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	System Development				4,911	1,100	2,200			
(U)	Site Preparation				40	641	4,000			
(U)	Deployment						10,357			
(U)	Logistics and Training					200	1,700			
(U)	X-Band Radar Test Support					3,025	3,747			
(U)	SPO Support				1,269	4,933				
(U)	Congressionally Approved Omnibus Source				1,000					
(U)	Total				7,220	9,899	22,004			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
* Prior year data not available; program transferred from the intelligence budget in FY 93 at the direction of Congress										
<u>Product Development Organizations</u>										
Raytheon Elec Sys Sudbury, MA	C/CPIF/AF	Mar 91	21,000	21,311	*	4,911	5,774	13,657	TBD	Continuing
Misc	Various	Various			*	40	800	4,600	TBD	Continuing
<u>Support and Management Organizations</u>										
MITRE	SS/PR	Oct 95	N/A	N/A	*	420	1,200	700	TBD	Continuing
TEMS	C/PR	Various	N/A	N/A	*	178	300	300	TBD	Continuing
SETA	C/PR	Oct 97	N/A	N/A	*	324	925	400	TBD	Continuing
Misc	Various	Various	N/A	N/A	*	347	900	2,347	TBD	Continuing
Project 4279			Page 15 of 16 Pages				Exhibit R-3 (PE 0305910F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)					DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development		PE NUMBER AND TITLE 0305910F Spacetrack (Space)			PROJECT 4279	
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>						
<u>Test and Evaluation Organizations</u>						
None						
<u>Approved Omnibus Source</u>						
			1,000			
Government Furnished Property: Not Applicable.						
Subtotal Product Development	*	4,951	6,574	18,257	TBD	Continuing
Subtotal Support and Management	*	1,269	3,325	3,747	TBD	Continuing
Subtotal Test and Evaluation	*	0	0	0	0	0
Approved Omnibus Source			1,000			
Total Project	*	7,220	9,899	22,004	TBD	Continuing

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305911F Defense Support Program (Space)
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<i>COST (In Thousands)</i>	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	24,668	20,689	12,037	7,595	7,587	4,462	4,760	0	1,941,972
3615 Shield/Alert	9,526	8,125	8,432	3,509	4,060	0	0	0	59,499
3624 Defense Support Program	15,142	12,564	3,605	4,086	3,527	4,462	4,760	0	1,882,473
Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification
 The Defense Support Program (DSP) is a system of satellites in geostationary orbits, fixed and mobile ground processing stations, one multi-purpose facility, and a ground communications network. DSP's primary mission is to provide tactical warning and limited attack assessment of a ballistic missile attack. Shield/ALERT (Attack and Launch Early Reporting to Theater) is a ground station mission processing upgrade which exploits inherent satellite capability to provide theater missile warning and cueing. DSP is an operational system and is funded in Budget Activity 7, Operational Systems Support.

(U) Acquisition Strategy:
 The ALERT squadron was activated 1 Oct 94 and achieved Initial Operating Capability 10 Mar 95. Further Shield RDT&E efforts are required to meet Air Force Space Command (AFSPC) Full Operational Capability requirements and to use as the pathfinder for the first increment of the ground consolidation.

(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget FY 1998 PB	25,009	23,193	39,946	2,054,500
(U) Appropriated Value	26,397	23,193		
(U) Adjustments to Appropriated Value				
a. Congressional General Reduction/Adds	-830	-1,959		
b. SBIR/Other	-558	-545		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming (BTR)	-300			
e. Rescissions	-41			
(U) Adjustments to Budget Years Since FY 1998 PB			-27,909	
(U) Current Budget Submit/FY 1999 President's Budget	24,668	20,689	12,037	1,941,972

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305911F Defense Support Program (Space)					
<p>(U) Change Summary Explanation: Funding: \$300K FY97 RDT&E BTR to other AF priorities and \$41K FY97 RDT&E Bosnia recission. \$66K FY98 RDT&E pending reprogramming to fund higher priority AF requirements. FY99 adjustment funded higher priority Air Force, Department of Defense program requirements and Nonpay inflation adjustment. Schedule: FY98/FY99 launch schedule adjusted to match current AFSPC launch manifest. Technical: None.</p>									
(U) C. Other Program Funding Summary (\$ in Thousands)									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) Missile Procurement (PE 305911F, BA-05, P-28)	60,357	104,841	89,904	113,515	111,537	103,680	106,491	272,000	7,213,100
(U) Other Procurement (PE 305911F, BA-65, P-N/A)	3,386	181	202	14	6	0	0	0	1,201,700
<u>Related RDT&E:</u>									
(U) PE 603441F - SBIRS Dem/Val	252,492	202,433	160,262	154,133	115,398	0	0	0	1,432,558
(U) PE 604442F - SBIRS Low EMD	0	0	33,328	79,064	148,749	420,206	823,950	5,938,759	7,444,056
(U) PE 604441F - SBIR High EMD	193,018	316,467	538,438	564,239	395,905	269,798	143,059	102,566	2,801,661
(U) D. Schedule Profile									
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>	
	1	2	3	4	1	2	3	4	
(U) DSP Satellite Deliveries							X		
(U) Begin ALERT Military Org. Maint.	X								
(U) Final ALERT Hardware Installation		X							
(U) SBIRS MCS Operational (Increment I)								X	
(U) DSP Satellite Launches		X				X		X	

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BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0305911F Defense Support Program (Space)

COST (In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3615 Shield/Alert	9,526	8,125	8,432	3,509	4,060	0	0	0	59,499

(U) A. Mission Description and Budget Item Justification

The Shield project identified changes to existing DSP processing to enhance theater missile defense warning capabilities. These enhancements will facilitate more timely and accurate detection, identification, location and tracking of theater missile threats. This data supports attack operations/counterforce operations by providing accurate, timely launch point prediction. This information will also support active and passive defense forces by providing target cueing data and precise impact point prediction. The Air Force will transition these enhancements to ALERT, an operational system that provides continuous real-time warning to the warfighter.

(U) Acquisition Strategy:

The ALERT squadron was activated on 1 Oct 94 with an ALERT Initial Operating Capability reached on 10 Mar 95. Further Shield RDT&E efforts will be required to meet the Air Force Space Command Full Operational Capability requirements and for use as the pathfinder for SBIRS ground consolidation.

(U) FY 1997 (\$ in Thousands):

- (U) \$4,629 Continued engineering task development to prototype and implement ALERT capabilities leading up to Increment I.
- (U) \$2,672 Continued SBIRS ground consolidation developmental test and evaluation.
- (U) \$2,225 Technical analysis and independent verification and validation of contractor by FFRDC.
- (U) \$9,526 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$4,557 Continue engineering task development to prototype and implement ALERT capabilities leading up to Increment I.
- (U) \$2,239 Continue SBIRS ground consolidation developmental test and evaluation.
- (U) \$2,194 Technical analysis and independent verification and validation of contractor by FFRDC.
- (U) -\$931 Funds will transfer from BPAC 3624 to BPAC 3615 within PE 35911F to correct erroneous Shield/ALERT reduction.
- (U) \$66 Pending reprogramming to fund higher priority AF requirements.
- (U) \$8,125 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$5,175 Continue engineering task development to prototype and implement ALERT capabilities leading up to Increment I.
- (U) \$3,440 Continue SBIRS ground consolidation developmental test and evaluation.
- (U) \$1,931 Technical analysis and independent verification and validation of contractor by FFRDC.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0305911F Defense Support Program (Space)	3615
- (U) -\$2,114	Funds will transfer from BPAC 3624 to BPAC 3615 within PE 35911F to correct erroneous Shield/ALERT reduction.	
- (U) \$8,432	Total	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development			PE NUMBER AND TITLE 0305911F Defense Support Program (Space)				PROJECT 3615			
(U) B. Program Change Summary (\$ in Thousands)										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget/FY 1998 PB		9,089	9,108	8,602	56,697					
(U) Appropriated Value		9,089	9,108							
(U) Adjustments to Appropriated Value										
a. Congressional General Reductions			-864							
b. SBIR			-119							
c. Omnibus or Other Above Threshold Reprogramming										
d. Below Threshold Reprogramming		437								
(U) Adjustments to Budget Years Since FY 1998 PB				-170						
(U) Current Budget Submit/ FY 1999 President's Budget		9,526	8,125	8,432	59,499					
(U) Change Summary Explanation:										
Funding: \$437K FY97 BTR from BPAC 3624 within this program element for Version 12 User's Manuals and Theater Situational Analyst (TSA) Training. \$66K FY98 RDT&E pending reprogramming to fund higher priority AF requirements. FY99 reduction is for Non-Pay Inflation										
Schedule: None.										
Technical: None.										
(U) C. Other Program Funding Summary (\$ in Thousands)										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
(U) Missile Procurement (PE 305911F, BA-05, P-28)		60,357	104,841	89,904	113,515	111,537	103,680	106,491	272,000	7,213,100
(U) Other Procurement (PE 305911F, BA-65, P-N/A)		3,386	181	202	14	6	0	0	0	1,201,700
Related RDT&E:										
(U) PE 603441F - SBIRS Dem/Val		252,492	202,433	160,262	154,133	115,398	0	0	0	1,432,558
(U) PE 604442F - SBIRS Low EMD		0	0	33,328	79,064	148,749	420,206	823,950	5,938,759	7,444,056
(U) PE 604441F - SBIR High EMD		193,018	316,467	538,438	564,239	395,905	269,798	143,059	102,566	2,801,661
(U) D. Schedule Profile										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
		1	2	3	4	1	2	3	4	
(U) Begin ALERT Military Org. Maint.		X								
Project 3615		Page 4 of 13 Pages					Exhibit R-2 (PE 0305911F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY					PE NUMBER AND TITLE						PROJECT	
7 - Operational System Development					0305911F Defense Support Program (Space)						3615	
(U) D. <u>Schedule Profile</u>					<u>FY 1997</u>		<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Final ALERT Hardware Installation		X										
(U) SBIRS MCS Operational (Increment I)												X
(U) ALERT Version 12 Operational							X					
(U) ALERT Version 14 Operational									X			
(U) Begin ALERT Military Contractor Support Organization Transition						X						
(U) Theater Situational Analyst (TSA) System User's Manual & Training								X				
(U) TSA Transition									X			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305911F Defense Support Program (Space)	PROJECT 3615
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Contractor Engineering Support	835	850	900
(U) Software Development	1,458	1,535	1,825
(U) Program Management Support	1,711	1,740	1,950
(U) Training Development	625	212	500
(U) Developmental Test and Evaluation	2,672	2,239	3,440
(U) Technical Data	0	220	0
(U) FFRDC	2,225	2,194	1,931
(U) Adjustments: (Pending Reprogramming)		-865	-2,114
(U) Total	9,526	8,125	8,432

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Aerojet	CPAF	Aug 92	7,898	7,898	7,898	0	0	0	0	7,898
SPARTA	CPAF	Aug 94	487	487	487	0	0	0	0	487
Lincoln Lab	PO	Mar 95	288	288	288	0	0	0	0	288
Aerojet (FO)	CPAF	Oct 95	34,268	33,860	6,948	6,447	5,779	7,715	6,769	33,658
Nichols Research Corporation			2,508	2,508	239	469	900	900	0	2,508

Support and Management Organizations

<u>Program Office</u>										
Support			N/A	N/A	63	0	0	0	0	63
FFRDC			N/A	N/A	3,128	2,225	2,194	1,931	800	10,278
Dept Air Force			N/A	N/A	6,369	385	235	0		6,989

Test and Evaluation Organizations

Not Applicable

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February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0305911F Defense Support Program (Space)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305911F Defense Support Program (Space)			PROJECT 3615		
Government Furnished Property:									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Test Equipment			Aug 94	427	0	0	0	0	427
Subtotal Product Development				15,860	6,916	6,561	8,615	6,769	44,721
Subtotal Support and Management				9,560	2,610	2,429	1,931	800	17,330
Subtotal Government Furnished Equipment				427	0	0	0	0	427
Adjustments: (Pending Reprogrammings)						-865	-2,114	0	-2,979
Total Project				25,847	9,526	8,125	8,432	7,569	59,499

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305911F Defense Support Program (Space)	PROJECT 3624
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COST (In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3624 Defense Support Program	15,142	12,564	3,605	4,086	3,527	4,462	4,760	0	1,882,473

(U) A. Mission Description and Budget Item Justification

The Defense Support Program (DSP) system provides a space-based surveillance system to detect and report missile and space launches and nuclear detonations in near real time during pre-, trans-, and post-attack periods. The DSP system consists of a constellation of satellites in geostationary orbits, fixed and mobile ground processing stations, one multi-purpose facility, and a ground communications network. DSP's primary mission is to provide tactical warning and limited attack assessment of a ballistic missile attack. DSP also detects and reports nuclear detonation events and provides information for theater warning and exploitation. This program element funds development to modernize ground stations to ensure continued operability, integration of satellites to launch vehicles, satellites and ground station hardware, procurement, and DSP ground stations operation.

(U) Acquisition Strategy:

DSP is currently sustaining the production of satellites 19 through 23. This sustainment includes post production storage, testing, launch preparation, and on orbit testing. Current contract efforts are required to stretch the support of launch centers to 12 months from the originally contracted 6 month launch centers. Satellite 23 will be the last DSP satellite procured. The Space Based Infrared Systems satellites will replace DSP satellites starting in FY02.

(U) FY 1997 (\$ in Thousands)

- (U) \$292 Performed DSP Spacecraft developmental engineering efforts
- (U) \$2,321 Performed DSP Sensor developmental engineering efforts
- (U) \$4,790 Other Government costs (Integrated Surveillance Systems concept, Space Long Range Planning, Y2K)
- (U) \$740 Technical analysis and independent verification and validation of contractor by FFRDC
- (U) \$693 Continued acquisition and engineering support.
- (U) \$1,000 Continued acquisition logistics engineering development and sustaining capabilities
- (U) \$3,607 Program office support (TDYs, supplies, computer support, etc)
- (U) \$1,699 Pending reprogramming to fund higher priority AF requirements.
- (U) \$15,142 Total

(U) FY 1998 (\$ in Thousands)

- (U) \$3,300 Software change to accommodate Year 2000 roll-over.
- (U) \$1,939 Integrated Surveillance Systems Concept
- (U) \$931 Funds will transfer from BPAC 3624 to BPAC 3615 within PE 35911F to correct erroneous Shield/ALERT reduction.
- (U) \$3,395 Other Government Costs (Long Range Planning, ANSER)
- (U) \$2,999 Funds will be reprogrammed to other Air Force programs.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)					DATE February 1998					
BUDGET ACTIVITY		PE NUMBER AND TITLE			PROJECT					
7 - Operational System Development		0305911F Defense Support Program (Space)			3624					
- (U) \$12,564 Total										
(U) <u>FY 1999 (\$ in Thousands):</u>										
- (U) \$200 Integrated Surveillance Systems Concepts										
- (U) \$700 Year 2000 rollover										
- (U) \$2,114 Funds will transfer from BPAC 3624 to BPAC 3615 within PE 35911F to correct erroneous Shield/ALERT reduction.										
- (U) \$591 Other Government Cost										
- (U) \$3,605 Total										
(U) B. Program Change Summary (\$ in Thousands)		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>					
(U) Previous President's Budget/FY 1998 PB		15,920	14,085	31,344	1,997,803					
(U) Appropriated Value		15,920	14,085							
(U) Adjustments to Appropriated Value										
a. Congressional General Reductions			-1,095							
b. SBIR/Other			-426							
c. Omnibus or Other Above Threshold Reprogramming										
d. Below Threshold Reprogramming		-778								
e. Rescissions										
(U) Adjustments to Budget Years Since FY 1998 PB				-27,739						
(U) Current Budget Submit/ FY 1999 President's Budget		15,142	12,564	3,605	1,882,473					
(U) Change Summary Explanation:										
Funding: \$300K FY97 RDT&E BTR to other AF priorities, \$437K FY97 RDT&E BTR to BPAC 3615 within this program element, and \$41K FY97 RDT&E to Bosnia rescission. FY99 adjustments funded higher priority Air Force, Department of Defense program requirements and Nonpay inflation.										
Schedule: FY98/FY99 launch schedule adjusted to match current AFSPC launch manifest.										
Technical: None.										
(U) C. Other Program Funding Summary (\$ in Thousands)		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
U) Missile Procurement (PE 305911F, BA-05, P-28)		60,357	104,841	89,904	113,515	111,537	103,680	106,491	272,000	7,213,100
(U) Other Procurement (PE 305911F, BA-65, P-N/A)		3,386	181	202	14	6			0	1,201,700

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305911F Defense Support Program (Space)				PROJECT 3624	
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Complete</u>	<u>Total Cost</u>
<u>Related RDT&E:</u>									
(U) PE 603441F - SBIRS Dem/Val	252,492	202,433	160,262	154,133	115,398	0	0	0	1,432,558
(U) PE 604442F - SBIRS Low EMD	0	0	33,328	79,064	148,749	420,206	823,950	5,938,759	7,444,056
(U) PE 604441F - SBIR High EMD	193,018	316,467	538,438	564,239	395,905	269,798	143,059	102,566	2,801,661
(U) D. <u>Schedule Profile</u>									
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>	
	1	2 3	4	1	2 3	4	1	2 3	4
(U) DSP 23 Satellite delivery								X	
(U) Satellite launches		X							X
(U) Software Releases				X	X				
(U) Year 2000 DSP renovation				X	X	X	X		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)		DATE February 1998	
BUDGET ACTIVITY	PE NUMBER AND TITLE		PROJECT
7 - Operational System Development	0305911F Defense Support Program (Space)		3624
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Program Office Support	3,607		
(U) DSP Spacecraft Developmental Engineering efforts	292		
(U) DSP Sensor Developmental Engineering efforts	2,321		
(U) Other Government Costs(See *note)	4,790	8,634	1,491
(U) FFRDC	740		
(U) Continued acquisition and engineering support	693		
(U) Acq Logistics Engineering Development & Sustainment	1,000		
(U) Adjustments	1,699	3,930	2,114
(U) Total	15,142	12,564	3,605
*Note: OGC includes - Integrated Surveillance Systems concept, Space Long Range Planning, Y2K roll-over.			
Project 3624	Page 11 of 13 Pages	Exhibit R-3 (PE 0305911F)	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305911F Defense Support Program (Space)					PROJECT 3624
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Aerojet*	CPAF	Oct 93	25,719	25,719	25,719	0	0	0	0	25,719
Aerojet	CPAF	Sep 93	9,025	9,025	9,025	0	0	0	0	9,025
Aerojet	CPFF		25,743	25,743	25,743	0	0		0	25,743
Aerojet	CPAF	Oct 95	2,578	2,578	2,578					2,578
Loral	FPI/AF/CPF		28,137	37,732	37,732	0	0	0	0	37,732
DOE	P.O.		10,724	10,724	10,724	0	0	0	0	10,724
Loral	CPAF		22,975	22,975	22,975	0	0	0	0	22,975
* EAC is also funded by other appropriations.										
<u>Support and Management Organizations</u>										
Various	MIPRs				6,301	0	0	0	0	6,301
Aerojet	CPFF		1,305	1,305	1,305	0	0	0	0	1,305
Aerojet/ Consolidated	FFP	May 96	2,518	2,518	197	2,321	0	0	0	2,518
FFRDC	MORD		N/A	N/A	41,369	740	0	0	0	42,109
Other Gov't Cost *			N/A	N/A	20,596	4,790	8,634	1,491	16,835	52,346
TRW	CPFF		9,872	9,872	9,872	0	0	0	0	9,872
TRW Consolidated	CPAF	May 96	292	292	0	292	0	0	0	292
PRC	FPIF	Apr 94	7,579	7,579	5,886	1,693	0	0	0	7,579
SPARTA	CPAF	Aug 94	150	150	150	0	0	0	0	150
	MORDs		15,043	15,043	15,043	0	0	0	0	15,043
Program Office Support	Various		N/A	N/A	64,494	3,607	0	0	0	68,101
*Note: OGC includes: HQ AFMC Space Systems Support Group for Year 2000 software development, Integrated Surveillance Systems Concept.										
<u>Test and Evaluation Organizations</u>										
Not Applicable.										
Project 3624					Page 12 of 13 Pages			Exhibit R-3 (PE 0305911F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305911F Defense Support Program (Space)	PROJECT 3624
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Government Furnished Property:
Not Applicable

Subtotal Product Development	134,496	0	0	0	0	134,496
Subtotal Support and Management	165,213	13,443	8,634	1,491	16,835	205,616
Subtotal Test and Evaluation	0	0	0	0	0	0
Adjustments: (Pending Reprogramming)		1,699	3,930	2,114		1,542,361
Adjustments: (Previous DSP Contracts)	1,534,618					
Project Total	1,834,327	15,142	12,564	3,605	16,835	1,882,473

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305913F Nudet Detection System	PROJECT 2808
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	Cost to Complete	Total Cost
2808 Nuc Detonation Det Sys (Sensors)	12,818	13,360	13,314	14,352	13,342	12,596	14,704	Continuing	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

The Nuclear Detonation (NUDET) Detection System (NDS) consists of space, control, and user equipment segments. The space segment consists of NUDET detection sensors on the GPS/NDS satellites. The control segment consists of ground control software and is known as the Integrated Correlation and Display System (ICADS). The user equipment segment consists of the Ground NDS Terminals (GNT). The NDS provides a worldwide, highly survivable capability to detect, locate, and report any nuclear detonations in the earth's atmosphere or in near space in near-real time. The NDS supports NUDET detection requirements for AFSPC (Integrated Tactical Warning and Attack Assessment [ITWAA]), USSTRATCOM (Nuclear Force Management), and AFTAC (Treaty Monitoring). This program is in budget activity 7 - Operational System Development, because it is a post-Milestone III program.

(U) Acquisition Strategy:

The NDS Acquisition Strategy is to develop and procure components to sustain the U. S. NDS capability for the GPS Block IIR and IIF satellites. Funding is MIPRed from DoD and Department of Energy (DoE) to Sandia and Los Alamos National Laboratories on an existing contract vehicle.

(U) FY 1997 (\$ in Thousands):

- (U) \$ 10,171 Continue ICADS and GNT development
- (U) \$ 900 Continue NDS EMP sensor compatibility and on-orbit qualification
- (U) \$ 1,241 Continue ICADS, GNT and Advanced RADEC Detection Units (ARDU) system engineering and program management
- (U) \$ 506 Continue mission support requirements
- (U) \$ 12,818 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$ 6,703 Continue ICADS and GNT development
- (U) \$ 1,160 Continue NDS sensor on-orbit qualification
- (U) \$ 3,808 Continue ICADS, GNT, ARDU, NDS sensors, and GPS/NDS commanding requirements system engineering and program management
- (U) \$ 1,689 Continue mission support requirements
- (U) \$ 13,360 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305913F Nudet Detection System			PROJECT 2808			
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$10,271 Continue ICADS and GNT development – (U) \$ 1,181 Continue NDS sensor on-orbit qualification – (U) \$ 192 Continue ICADS, GNT, ARDU, NDS sensors, and GPS/NDS commanding requirements system engineering and program management – (U) \$ 1,670 Continue mission support requirements – (U) \$13,314 Total 										
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total Cost</u>				
(U) Previous President's Budget (FY1998 PB)		13,018	14,145	14,982		Continuing				
(U) Appropriated Value		13,623	14,145							
(U) Adjustments to Appropriated Value										
a. Cong Gen Reductions		-304	-469							
b. SBIR		-301	-316							
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming		-200								
e. Rescission										
(U) Adjustments to Budget Years Since FY 1998 PB				-1,668						
(U) Current Budget Submit/FY 1999 President's Budget		12,818	13,360	13,314		Continuing				
(U) Change Summary Explanation:										
<p>Funding: FY97 Below Threshold Reprogramming (BTR) to PE 030311F, Defense Satellite Communications System (DSCS) (-\$200). FY99 adjustments funded higher priority DoD and AF priorities (-\$1,400) and non-pay inflation (-\$268). Schedule: ICADS IIF delayed 10 months & GNT Phase 2 Delivery delayed from 4QTR 97 to 2QTR 98. Technical: No change.</p>										
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Operations & Maintenance, (PE 0305913F, BA 1, Operating Forces		5,161	5,350	5,867	5,978	6,263	8,945	7,687	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305913F Nudet Detection System				PROJECT 2808	
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) Missile Procurement, (PE 0305913F, BA 45 - Space and Other Support, P-22)	4,081	950	2,949	1,575	1,491	1,522	1,556	Cont	Cont
(U) Other Procurement, (PE 0305913F, BA 63 - Electronics and Telecom Equipment, P-64)	2,085	7,792	1,278	1,741	1,540	3,370	0	Cont	Cont
<u>Related RDT&E:</u>									
(U) PE 305165F, NAVSTAR GPS (Space/Ground Segment)									
(U) PE 604480F, GPS Block IIF									
(U) PE 305911F, Defense Support Program									
(U) D. <u>Schedule Profile</u>									
	<u>FY 1997</u>			<u>FY1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1
(U) ICADS Milestones & Program Events									
(U) IIF Use Case Model Overview									x
(U) IIF System Specification Review									x
(U) IIF Elaboration Phase Review									x
(U) IIR Acceptance Test (AT)						x			
(U) GNT Milestones & Program Events									
(U) Phase II GNT Delivery									x
(U) Phase I Operational			x						

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305913F Nudet Detection System				PROJECT 2808		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Systems Engineering				1,208	1,277	1,065				
(U) Software Development				7,077	6,793	6,452				
(U) Software Upgrade				2,000	2,375	3,268				
(U) Miscellaneous				1,387	1,534	1,331				
(U) Technical Data				92	153	133				
(U) Development Test & Evaluation				791	921	799				
(U) Program Management Support				263	307	266				
(U) Total				12,818	13,360	13,314				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
ICADS:										
Sandia Labs	MIPR*	Jan 96	Cont	Cont	17,094	9,055	5,588	10,271	Cont	Cont
SAIC	Time/Matls	Dec 95	Cont	Cont	1,453	831	489	767	Cont	Cont
GNT:										
Sandia Labs	MIPR*	Jan 96	Cont	Cont	9,128	1,116	1,115	0	Cont	Cont
Intermetrics	CPFF	Dec 93	1,262	1,262	1,262	0	0	0	0	1,262
SAIC	Time/Matls	Dec 95	Cont	Cont	399	348	330	300	Cont	Cont
Project 2808				Page 4 of 5 Pages				Exhibit R-3 (PE 0305913F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305913F Nudet Detection System					PROJECT 2808
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
GPS Operational Support Contract (GOSC)/NUDET Augmentation Payload (NAP)/Combined X-ray & Dosimeter (CXD) sensors:										
Sandia Labs	MIPR	Oct 97	4,287	4,287	0	287	3,808	192	0	4,287
SAIC	Time/Matls	Dec 97	432	432	0	0	266	166	0	432
W-Sensor Support:										
SRI	CPFF	Aug 94	415	415	415	0	0	0	0	415
Los Alamos	MIPR	Jan 96	Cont	Cont	2,291	693	473	479	Cont	Cont
Sandia Labs	MIPR	Oct 94	2,635	2,635	399	0	817	702	717	2,635
Mission	Multiple	N/A	Cont	Cont	2,886	488	474	437	Cont	Cont
<u>Support and Management Organizations</u>										
Prog Contractual Spt.	Multiple	N/A	1,534	1,534	1,534	0	0	0	0	1,534
<u>Test and Evaluation Organizations</u>										
OO-ALC/LMCF			9	9	9	0	0	0	0	9
Subtotal Product Development					35,327	12,818	13,360	13,314	Cont	Cont
Subtotal Support and Management					1,534	0	0	0	0	1,534
Subtotal Test and Evaluation					9	0	0	0	0	9
Total Project					36,870	12,818	13,360	13,314	Cont	Cont
Project 2808					Page 5 of 5 Pages			Exhibit R-3 (PE 0305913F)		

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BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0305913F Nudet Detection System

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305917F DoD Space Architect (Space)				PROJECT 4746	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4746 Space Architect	10,939*	13,480	13,714	14,511	14,428	14,345	14,732	0	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

*FY97 and earlier funding contained in PE603855F. Funding transferred from PE603855 to this PE in FY1998 - 2003 to consolidate R&D and O&M appropriations into one Program Element.

(U) **A. Mission Description and Budget Item Justification** - The Under Secretary of Defense for Acquisition and Technology (USD(A&T)) established the DoD Office of the Space Architect (OSA) to consolidate DoD space system architecture development responsibilities into a single organization. The OSA was one of DoD's responses to Congressional concerns regarding DoD space management. This organization works to integrate space system architectures, eliminate unnecessary vertical stovepiping of space programs, achieve efficiencies in acquisition and future operations through space program integration, and thereby improve space support to military operations. The OSA obtains direct support from various space planning and development organizations across the federal government and industry for DoD space architecture planning and development. This program is in Budget Activity 7 because the architecture studies affect the design and acquisition of systems currently under development.

(U) **Acquisition Strategy:** RDT&E funds will be used to obtain infrastructure support and direct support from various space planning and development organizations across the DoD and industry, including FFRDCs and contracted System Engineering and Technical Assistance (SETA) in direct support of DoD space architecture planning and development. Funds will be applied to existing contract vehicles.

- As primary support, the DoD Space Architect proposes using two existing Space & Missile Center (SMC) contracts for technical support:
 - Engineering, Analysis, Design and Development (EADD) Contract; Science Applications International Corporation (SAIC)
 - Engineering, Analysis and Design (EAD) Contract; Nichols Research Corporation
- These contracts currently provide support to the Air Force Space and Missile Systems Center long-range planning, conceptual development, and engineering analysis and assessment efforts.

(U) **FY 1997 (\$ in Thousands):**

- (U) \$ 109 Launch Study
- (U) \$ 133 MILSATCOM Study
- (U) \$ 3,022 Satellite Operations Studies
- (U) \$ 2,444 Space Control Study
- (U) \$ 5,231 Other Architecture Studies and Documentation
- (U) \$10,939 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE	
BUDGET ACTIVITY		PROJECT	
7 - Operational System Development		0305917F DoD Space Architect (Space)	
		4746	
(U) <u>FY 1998 (\$ in Thousands):</u>			
- (U) \$ 3,500 Environmental Sensing Study			
- (U) \$ 1,500 Launch Study			
- (U) \$ 100 MILSATCOM Study			
- (U) \$ 625 Satellite Operations Studies			
- (U) \$ 360 Space Control Study			
- (U) \$ 345 SBIRS Study			
- (U) \$ 278 Pos/Nav Study			
- (U) \$ 6,772 Other Architecture Studies and Documentation			
- (U) \$13,480 Total			
(U) <u>FY 1999 (\$ in Thousands):</u>			
- (U) \$ 800 Environmental Sensing Study			
- (U) \$ 600 Launch Study			
- (U) \$ 500 MILSATCOM Study			
- (U) \$ 3,500 Dissemination Study			
- (U) \$ 3,000 Launch Vehicles Study			
- (U) \$ 5,314 Other Architecture Studies and Documentation			
- (U) \$13,714 Total			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>			
	<u>FY 1997*</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Previous President's Budget (FY1998 PB)	10,957	14,590	14,590
(U) Appropriated Value	11,601	14,590	
(U) Adjustments to Appropriated Value			
a. Cong Gen Reductions	- 345	-743	
b. SBIR	- 299	-367	
c. Omnibus or Other Above Threshold Reprogram			
d. Below Threshold Reprogramming			
e. Rescissions	-18		
(U) Adjustments to Budget Years Since FY 1998 PB			-876
(U) Current Budget Submit/FY1999 President's Budget	10,939	13,480	13,714
Project 4746	Page 2 of 5 Pages	Exhibit R-2 (PE 0305917F)	

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0305917F DoD Space Architect (Space)	4746
*Contained in PE603855F		
(U) Change Summary Explanation: Funding: None. Schedule: None Technical: None		
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>		
(U) N/A		
(U) D. <u>Schedule Profile</u>		
(U) N/A - Level of effort studies		
Project 4746	Page 3 of 5 Pages	Exhibit R-2 (PE 0305917F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305917F DoD Space Architect (Space)			PROJECT 4746		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
Environmental Sensing					769	3,500	800			
Launch Study					109	1,500	600			
MILSATCOM					133	100	500			
NSCP					146	150	150			
Position-Navigation					273	278	700			
Satellite Operations					3,022	625	100			
Space Control					2,444	360	100			
Dissemination					0	0	3,500			
DUSD(S) Studies					2,000	351	0			
Other Studies (Congressional. DoD Studies)					0	3,133	756			
Launch Vehicles					0	0	3,000			
In-House Support					2,043	3,483	3,508			
Total					10,939	13,480	13,714			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
None					0	0	0	0	Cont	
<u>Support and Management Organizations</u>										
Aerospace	C/CPAF	1993	N/A	N/A		2,046	1,038	1,297	Cont	Cont
ANSER	C/CPFF	1993	N/A	N/A		389	884	584	Cont	Cont
MITRE	C/CPAF	1993	N/A	N/A		632	770	575	Cont	Cont
SAC	C/CPAF	1993	N/A	N/A		550	0	0	Cont	Cont
Project 4746					Page 4 of 5 Pages			Exhibit R-3 (PE 0305917F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0305917F DoD Space Architect (Space)				PROJECT 4746	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
SEI	C/CPAF	1995	N/A	N/A		40	310	225	Cont	Cont
TASC	C/CPAF	1994	N/A	N/A	0	700	325	325	Cont	Cont
EAD	C/CPAF	1997	N/A	N/A		3,117	5,014	5,122	Cont	Cont
EADD	C/CPAF	1997	N/A	N/A		3,465	5,139	5,586	Cont	Cont
<u>Test and Evaluation Organizations</u>										
None					0	0	0	0	0	
Government Furnished Property: None										
Subtotal Product Development						0	0	0	0	0
Subtotal Support and Management						10,939	13,480	13,714	Cont	Cont
Subtotal Test and Evaluation						0	0	0	0	0
Total Project						10,939	13,480	13,714	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305953F Evolved Expendable Launch Veh (Space)	PROJECT 4594
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4594 EELV Prod & Opns	0	0	3,316	3,397	3,477	2,320	766	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification:

The Evolved Expendable Launch Vehicle (EELV) program is a space launch system development program. The mission of the EELV program is to partner with industry to develop a national launch capability that satisfies the Government's National Mission Model (NMM) requirements and reduces the cost of space launch by at least 25%. The EELV system includes the launch vehicles, infrastructure, support systems, and interfaces. EELV will provide up to two families of launch vehicles that will launch the Government portion of the NMM currently serviced by Titan II, Delta II, Atlas II, and Titan IV. Evolved from current expendable launch systems or components thereof, EELV will support military, intelligence, and civil mission requirements. This program element is in Budget Activity 7, Operational System Development, because it supports operational deployment of a system in production.

(U) Acquisition Strategy:

The EELV concept of a family of launch vehicles emphasizes commonality of hardware and infrastructure and economies of scale to enhance production, operations, and support efficiencies. Cost improvements will be achieved through commonality; leveraging the commercial market place; reduction of supporting infrastructure (launch pads, manufacturing facilities, workforce); and optimization of production and launch operations, processes, and rates. EELV is an ongoing competitive program that initially used a rolling downselect acquisition strategy. In August 1995 four initial contracts were awarded for the Low Cost Concept Validation (LCCV) phase. In December 1996 the Air Force downselected to two contractors – Lockheed Martin and Boeing (originally McDonnell Douglas) – for the Pre-Engineering and Manufacturing Development (Pre-EMD) phase. In the summer of 1998, contracts will be awarded for the Engineering and Manufacturing Development (EMD) and Initial Launch Services (ILS) phase. The EMD/ILS approach maintains competition throughout the life of the program, leverages the growing commercial launch market, caps the Government's EMD costs, and allows partnership with industry, while still reducing the program's overall cost to launch the NMM by at least 25% over existing systems. The EELV system will launch the government portion of the NMM through 2020.

(U) FY 1997 (\$ in Thousands)

– (U) EELV was funded in PE 0603853F in FY 1997.
\$0

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0305953F Evolved Expendable Launch Veh (Space)	PROJECT 4594																																																							
<p>(U) <u>FY 1998 (\$ in Thousands)</u></p> <p>– (U) EELV is funded in PE 0603853F and PE 0604853F in FY 1998. \$0</p> <p>(U) <u>FY 1999 (\$ in Thousands)</u></p> <p>– (U) Start mission planning and non-recurring integration for Space Test Program (TSX-8). \$2,280</p> <p>– (U) Start mission planning and non-recurring integration for Defense Support Program (DSP) Satellite. \$1,036</p> <p>– (U) Total \$3,316</p> <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">3,383</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Congressional General Reductions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> b. Small Business Innovative Research</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or other above threshold reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY98 PB</td> <td></td> <td></td> <td style="text-align: center;">- 67</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">3,316</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) <u>Change Summary Explanation:</u></p> <ul style="list-style-type: none"> - Funding: The FY99 change is an inflation adjustment. - Schedule: Not Applicable. - Technical: Not Applicable. 				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>	(U) Previous President's Budget (FY 1998 PB)	0	0	3,383	Continuing	(U) Appropriated Value	0	0			(U) Adjustments to Appropriated Value					a. Congressional General Reductions					b. Small Business Innovative Research					c. Omnibus or other above threshold reprogramming					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY98 PB			- 67		(U) Current Budget Submit/FY 1999 President's Budget	0	0	3,316	Continuing
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>																																																					
(U) Previous President's Budget (FY 1998 PB)	0	0	3,383	Continuing																																																					
(U) Appropriated Value	0	0																																																							
(U) Adjustments to Appropriated Value																																																									
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e. Rescissions																																																									
(U) Adjustments to Budget Years Since FY98 PB			- 67																																																						
(U) Current Budget Submit/FY 1999 President's Budget	0	0	3,316	Continuing																																																					
Project 4594	Page 2 of 4 Pages	Exhibit R-2 (PE 0305953F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305953F Evolved Expendable Launch Veh (Space)				PROJECT 4594				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>												
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Comp</u>	<u>Total</u>			
(U) Missile Procurement, AF (PE 0305953F) (BA45, P-TBD)				204,576	360,818	359,442	599,717	Cont.	Cont.			
(U) Missile Procurement, AF (Quantity)				4	6	7	11	Cont.	Cont.			
(U) NRO (Non-AF budget)	18,600	4,200							95,100*			
(U) DARPA (Non-AF budget) (PE 0603226E)									9,845**			
<u>Related RDT&E:</u>												
(U) EELV Demonstration and Validation (PE 0603853F)	44,263	60,437	0	0	0	0	0	0	173,153			
(U) EELV EMD (PE 0604853F)		26,572	280,297	338,319	305,557	244,450	14,822	0	1,210,017			
* Total includes funding in FY96. ** Total includes funding in FY94.												
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Defense Acquisition Board - Milestone II												
(U) Development/Initial Launch Services contract awards												
(U) Start mission planning and first time integration for the STP TSX mission												
(U) Start mission planning and first time integration for DSP												
(U) Start launch vehicle production in 1st quarter FY00												

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0305953F Evolved Expendable Launch Veh (Space)				PROJECT 4594			
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>											
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>					
(U) Contract				0	0	3,316					
(U) Mission Support				0	0	0					
(U) Total				0	0	3,316					
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>											
Performing Organizations:											
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program	
<u>Product Development Organizations</u>											
Prime Contracts	C/FFP	Jun 98			0	0	0	3,316	Cont.	Cont.	
<u>Support and Management Organizations</u>											
					0	0	0	0	0	0	
<u>Test and Evaluation Organizations</u>											
Not Applicable					0	0	0	0	0	0	
Government Furnished Property: Not Applicable											
Subtotal Product Development					0	0	0	3,316	Cont.	Cont.	
Subtotal Support and Management					0	0	0	0	0	0	
Subtotal Test and Evaluation					0	0	0	0	0	0	
Total Project					0	0	0	3,316	Cont.	Cont.	
Project 4594											
Page 4 of 4 Pages											
Exhibit R-3 (PE 0305953F)											

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0308601F Modeling and Simulation Support
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	1,995	0	1,093	1,088	1,210	1,253	1,358	TBD	Continuing
1011 Joint Modeling & Simulation Integration Program (JMSIP)	1,995*	0	358	378	397	404	415	TBD	Continuing
4566 Executive Agent for Air/Space Natural Environment	0	0	735	710	813	849	943	TBD	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

*FY97 dollars are executed through PE0270601F, USAF Modeling and Simulation, but reported here for consistency.

(U) A. Mission Description and Budget Item Justification

This PE includes funding to support and organized growth and management of modeling and simulation (M&S) as the Air Force transitions from numerous legacy models and simulations to emerging DoD standard models and architecture. Numerous models currently exist and are being modified or developed for a broad range of areas including acquisition, analysis, test and evaluation, and training. JMSIP funds the upgrades to R&D funded legacy models selected through a board process. The selection process allows the board to influence the direction of legacy model development and interaction for the entire modeling and simulation community. Emphasis is placed on joint applicability and acceptance. Executive Agent for Air/Space Natural Environment supports M&S information, coordination, and expertise on natural environment representation and their interactions with other environmental representations. In turn, this supports joint wargaming architectures, databases, model development support for Joint Warfare Simulation (JWARS), Joint Simulation System (JSIMS), Joint Modeling and Simulation System (JMASS), and other joint M&S program offices. Primary users will be unified commanders and service components for use in joint exercises involving air, ground, sea, and space campaigns. PE also contains O&M funding for AF portion of Aggregate Level Simulation Protocol (ALSP); Data Standards; Advanced Connectivity; M&S Resource Repository (MSRR); model Verification, Validation, and Accreditation (VV&A); and High Level Architecture (HLA). FY97 funding contained in PE 27601, USAF Warming and Simulation.

(U) Acquisition Strategy

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0308601F Modeling and Simulation Support
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) FY 1998 President's Budget	2,038	0	943	Continuing
(U) Appropriated Value	2,038			
(U) Adjustments to Appropriated Value				
a. Cong Reductions	-43			
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
(U) Adjustments to Budget Years Since FY 1998PB			+150	
(U) Current Budget Submit/FY 1999 President's BUdget	1,995	0	1093	Continuing
 (U) Change Summary Explanation:				
Funding: FY99 adjustment supports increased M&S infrastructure efforts.				
Schedule: Not Applicable				
Technical: Not Applicable				

(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) O&M (AF 3400)			4,123	8,368	8,024	9,822	12,278	Contine	Contine

(U) D. Schedule Profile See individual R-2s

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0308601F Modeling and Simulation Support	PROJECT 1011
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1011 Joint Modeling & Simulation Integration Program (JMSIP)	1,995*	0	358	378	397	404	415	TBD	Continuing

Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0
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(U) A. Mission Description and Budget Item Justification

Numerous models currently exist and are being modified or developed for a broad range of areas including acquisition, analysis, test and evaluation, and training. JMSIP supports the upgrade of R&D funded legacy models selected through a board process. The selection process allows the board to influence the direction of legacy model development and interaction for the modeling and simulation community. Emphasis is placed on joint applicability and acceptance.

(U) Acquisition Strategy

(U) FY 1997 (\$ in Thousands):

- (U) \$ 707 Fund mission air functional representation in current campaign level legacy models.
- (U) \$ 600 Develop space functional representation for current campaign level legacy models.
- (U) \$ 450 Migrate selected legacy models to joint standards definition
- (U) \$ 238 Develop interoperability in selected campaign, mission, and engagement legacy models.
- (U) \$ 1,995 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Not Applicable

(U) FY 1999 (\$ in Thousands):

- (U) \$ 358 Migrate selected legacy models to joint standards definitions.
- (U) \$ 358 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0308601F Modeling and Simulation Support			PROJECT 1011			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>					
					<u>Cost</u>					
(U) FY 1998 President's Budget		2,038	0	358	Continuing					
(U) Appropriated Value		2,038								
(U) Adjustments to Appropriated Value										
a. Cong Reductions		-43								
b. SBIR										
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming										
(U) Adjustments to Budget Years Since FY 1998 PB										
(U) Current Budget Submit/FY 1999 President's Budget		1,995	0	358	Continuing					
(U) Change Summary Explanation:										
Funding: FY99 adjustment supports legacy model transitions.										
Schedule: Not Applicable										
Technical: Not Applicable										
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U) PE 27601F, O&M (AF 3400)		4,455	6,104	4,110	8,451	7,958	9,912	12,297	Continue	Continue
(U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
(U) Fund start of multiple projects	1	2	3	4	1	2	3	4	1	2
	X				X				X	

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0308601F Modeling and Simulation Support			PROJECT 1011		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
Executive Agent for Air/Space Natural Environment					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) Cost Categories										
(U) a. Software Development					1,770					
(U) b. Contractor Support					150		280			
(U) c. Program Management Support					50		50			
(U) d. Travel					25		28			
(U) Total					1,995	0	358			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Various	Various	Various			0	1,995	0	358	continuing	continuing
<u>Support and Management Organizations</u>										
None										
<u>Test and Evaluation Organizations</u>										
None										
Project 1011					Page 5 of 10 Pages			Exhibit R-3 (PE 0308601F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0308601F Modeling and Simulation Support			PROJECT 1011		
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>									
Government Furnished Property: N/A									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
None									
<u>Support and Management Property</u>									
None									
<u>Test and Evaluation Property</u>									
None									
Subtotal Product Development				0	1,995	0	358	continuing	continuing
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project				0	1,995	0	358	continuing	continuing

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0308601F Modeling and Simulation Support	PROJECT 4566
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4566 Executive Agent for Air/Space Natural Environment	0	0	735	710	813	849	943	TBD	Continuing

Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0
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(U) **A. Mission Description and Budget Item Justification**
 Air Force Combat Climatology Center (AFCCC), Scott AFB, IL has been designated as the DoD Modeling and Simulation (M&S) Executive Agent (EA) for Air and Space Natural Environment. This program provides funds for M&S EA joint wargaming architecture, database, model development support for Joint Warfare Simulation (JWARS), Joint Simulation System (JSIMS), Joint Modeling and Simulation System (JMASS), and other joint M&S program offices. Primary users will be unified commanders and service components for use in joint exercises involving air, ground, sea, and space campaigns.

(U) **Acquisition Strategy**

(U) FY 1997 (\$ in Thousands):
 - (U) \$0 Not Applicable

(U) FY 1998 (\$ in Thousands):
 - (U) \$0 Not Applicable

(U) FY 1999 (\$ in Thousands):
 - (U) \$ 435 Modeling & simulation data for CINC/AF models
 - (U) \$ 300 Production center model implementation
 - (U) \$ 735 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0308601F Modeling and Simulation Support			PROJECT 4566					
(U) B. <u>Program Change Summary (\$ in Thousands)</u>												
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u> <u>Cost</u>						
(U) FY 1998 President's Budget						Continuing						
(U) Appropriated Value												
(U) Adjustments to Appropriated Value												
a. Cong Reductions												
b. SBIR												
c. Omnibus or Other Above Threshold Reprogram												
d. Below Threshold Reprogramming												
(U) Adjustments to Budget Years Since FY 1998 PB				+735								
(U) Current Budget Submit/FY 1999 President's Budget				735		Continuing						
 (U) Change Summary Explanation:												
Funding: FY99 adjustment supports other M&S infrastructure activities.												
Schedule: Not Applicable												
Technical: Not Applicable												
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>												
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u> <u>Compl</u>	<u>Total</u> <u>Cost</u>		
(U) PE 38601F, O&M (AF 3400)			1,288	1,377	1,481	1,502	1,557	1,640	Continue	Continue		
 (U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Architecture					X			X		X		X
(U) Database Capabilities					X		X	X		X	X	X
(U) Mocels					X		X	X		X	X	X
Project 4566		Page 8 of 10 Pages						Exhibit R-2 (PE 0308601F)				

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BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0308601F Modeling and Simulation Support

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0308601F Modeling and Simulation Support			PROJECT 4566			
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U) Cost Categories										
(U) a. Software Development										
						348				
(U) b. Lab Overhead/Management										
						100				
(U) c. Prototyping										
						262				
(U) d. Travel										
						25				
(U) Total										
				0	0	735				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to <u>Complete</u>	Total <u>Program</u>
<u>Product Development Organizations</u>										
Various	Various	Various			0	0	0	735	continuing	continuing
<u>Support and Management Organizations</u>										
None										
<u>Test and Evaluation Organizations</u>										
None										
Project 4566				Page 9 of 10 Pages				Exhibit R-3 (PE 0308601F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0308601F Modeling and Simulation Support	PROJECT 4566
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: N/A

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property</u>									
None									
<u>Support and Management Property</u>									
None									
<u>Test and Evaluation Property</u>									
None									
Subtotal Product Development				0	0	0	735	continuing	continuing
Subtotal Support and Management									
Subtotal Test and Evaluation									
Total Project				0	0	0	735	continuing	continuing

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DATE

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BUDGET ACTIVITY

7 - Operational System Development

PE NUMBER AND TITLE

0401119F C-5 Airlift Squadrons

COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	1,122	9,160	47,940	0	0	0	0	0	58,222
4377 Airborne Broadcast Intelligence (ABI) C-5	651	0	0	0	0	0	0	0	651
4495 Avionics Modernization Program	471	9,160	47,940	0	0	0	0	0	57,571
Quantity of RDT&E Articles	1*/\$350	0	0	0	0	0	0	0	1*/\$350

* Note: One unit applies to project 4377

(U) A. Mission Description and Budget Item Justification

4377: Airborne Broadcast Intelligence (ABI): Airlift and Air Refueling Mission Area Plans identify a deficiency in ability to protect aircraft from hostilities during combat operations. The ABI system addresses this deficiency and increases aircrew survivability by providing aircrews with portable, on-aircraft mission equipment to receive and display critical real-time intelligence information. Strategic mobility aircrews often fly extended missions or transit enroute stations without full intelligence information capability. Information provided prior to mission departure is often outdated or incomplete upon arrival in theater. ABI provides increased threat situational awareness and enables aircrews to make mission modifications to avoid enemy threats under rapidly changing combat conditions. To limit system implementation costs, it is envisioned that ABI will “snap-on” to any Air Mobility Command (AMC) mobility fleet aircraft when this capability is needed. These systems are intended to be interchangeable between KC-135, KC-10, C-141, C-5, and C-17 operational wings, as required. This project was an FY97 new start to modify and integrate previously developed intelligence communication and display equipment to meet AMC requirements. This project was comprised of low technical risk efforts supporting fielded weapons systems and, therefore, was assigned to Budget Activity 7, Operational Systems Development.

4495: Avionics Modernization Program (AMP): (Formerly called the C-5 All-Weather Flight Control System (AWFCS) Reliability Improvement Program) The C-5 Avionics Modernization Program redesigns the avionics system architecture to support the AWFCS Reliability Improvement Program and Global Air Traffic Management (GATM). The AWFCS replaces low reliability Line Replaceable Units (LRUs) in the automatic flight control system and replaces aging mechanical instruments in the engine and flight systems. Current trends indicate some control systems will be unsupported within five years. A GATM capability, which encompasses communications, navigation, and surveillance requirements, will be concurrently incorporated into the aircraft to progress towards “free flight” capability. Integration of Enhanced Ground Proximity Warning System (EGPWS) Nav Safety enhancements is also part of the C-5 AMP (with separate funding). This project was comprised of low technical risk efforts supporting fielded weapons systems and, therefore, was assigned to Budget Activity 7, Operational Systems Development

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons
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(U) **Acquisition Strategy:**

Airborne Broadcast Intelligence (ABI): ABI acquisition strategy intends to make maximum use of existing software and non-developmental hardware.

Avionics Modernization Program: Program acquisition strategy establishes a single integrating contractor to: modify and qualify individual Commercial Off-the-Shelf (COTS) line replaceable units (LRU) and software to meet C-5 performance and Global Air Traffic Management (GATM) requirements, update existing C-5 engineering and technical data, develop interface control specifications based on performance requirements, prototype the new system, and support ground and flight testing.

(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	1,124	9,751	14,204	25,079
(U) Appropriated Value	1,153	9,751		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-24	-362		
b. SBIR	-5	-229		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-2			
(U) Adjustments to Budget Years Since FY1998 PB			33,736	
(U) Current Budget Submit/1999 President's Budget	1,122	9,160	47,940	58,222

(U) **Change Summary Explanation:**

Funding: Since FY98 PB, additional funds (\$33.7M) were added in FY99 to support GATM requirements. Since FY98 PB, FY98 C-5 Avionics Modernization Program (AMP) has been reduced by \$362K for general Congressional reductions and by \$229K for SBIR.

Schedule: N/A

Technical: N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons
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(U) **C. Other Program Funding Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
<u>(U) PE# 0401119F/C-5 Squadrons</u>									
Aircraft Procurement, AF, BA-7,C-5, ABI, BP-19	0	1,483	1,381	1,428	1,455	1,310	1,282	0	8,339
Aircraft Procurement, AF, BA-5,C-5 Mods, Avionics Modernization Program, BP-11	0	0	0	113,488	53,737	123,324	112,365	196,971	599,885
Aircraft Procurement, AF, BA-5, C-5 Mod, Enhanced Ground Proximity Warning System (EGPWS), BP-11	0	0	5,335	3,890	3,900	4,825	398	0	18,348
<u>(U) PE# 0401218F/KC-135 Squadrons</u>									
RDT&E, AF, BA-7	714	0	0	0	0	0	0	0	714
Aircraft Procurement, AF, BA-7, KC-135 Mods, ABI, BP-19	0	1,490	1,505	1,501	1,460	1,486	1,453	0	8,895
Operations & Maintenance, AF, BA-2	0	1,000	1,019	1,050	1,071	1,091	TBD	TBD	TBD
<u>(U) PE# 0305099F/Global Air Traffic Management (GATM)</u>									
RDT&E, AF, BA-7	3,000	0	27,056	18,155	10,695	9,776	7,806	TBD	TBD

(U) **D. Schedule Profile**

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Airborne Broadcast Intelligence												
(U) Avionics Modernization Program												
See Individual Project R-2 Exhibits for Schedule Profiles												

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons	PROJECT 4377
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4377 Airborne Broadcast Intelligence (ABI) C-5	651	0	0	0	0	0	0	0	651
Quantity of RDT&E Articles	1*/\$350								1*/\$350

(U) A. Mission Description and Budget Item Justification

4377: Airborne Broadcast Intelligence (ABI): Airlift and Air Refueling Mission Area Plans identify a deficiency in ability to protect aircraft from hostilities during combat operations. The ABI system addresses this deficiency and increases aircrew survivability by providing aircrews with portable, on-aircraft mission equipment to receive and display critical real-time intelligence information. Strategic mobility aircrews often fly extended missions or transit enroute stations without full intelligence information capability. Information provided prior to mission departure is often outdated or incomplete upon arrival in theater. ABI provides increased threat situational awareness and enables aircrews to make mission modifications to avoid enemy threats under rapidly changing combat conditions. To limit system implementation costs, it is envisioned that ABI will “snap-on” to any AMC mobility fleet aircraft when this capability is needed. These systems are intended to be interchangeable between KC-135, KC-10, C-141, C-5, and C-17 operational wings, as required. This project was an FY97 new start to modify previously developed intelligence communication and display equipment to meet AMC requirements. This project was comprised of low technical risk efforts supporting fielded weapons systems and, therefore, was assigned to Budget Activity 7, Operational Systems Development.

(U) FY 1997 (\$ in Thousands):

- (U) 586 Engineering study/analysis; prototype development, modification, retrofit, and qualification/certification testing.
- (U) 65 Mission support
- (U) \$651 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY	PE NUMBER AND TITLE						PROJECT		
7 - Operational System Development	0401119F C-5 Airlift Squadrons						4377		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>						<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	653	0	0						653
(U) Appropriated Value	672								
(U) Adjustments to Appropriated Value									
a. Congressional/General Reductions	-14								
b. SBIR	-5								
c. Omnibus or Other Above Threshold Reprogram									
d. Below Threshold Reprogramming									
e. Rescissions	-2								
(U) Adjustments to Budget Years Since FY1998 PB									
(U) Current Budget Submit/1999 President's Budget	651	0	0						651
 (U) Change Summary Explanation:									
Funding: N/A									
Schedule: N/A									
Technical: N/A									
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>									
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) <u>PE# 0401119F/C-5 Squadrons</u>									
Aircraft Procurement, AF, BA-7, C-5, ABI, BP-19	0	1,483	1,381	1,428	1,455	1,310	1,282	0	8,339
(U) <u>PE# 0401218F/KC-135 Squadrons</u>									
RDT&E, AF, BA-7, ABI	714	0	0	0	0	0	0	0	714
Aircraft Procurement, AF, BA-7, KC-135, ABI, BP-19	0	1,490	1,505	1,501	1,460	1,486	1,453	0	8,895
Operations & Maintenance, AF, BA-2, ABI	0	1,000	1,019	1,050	1,071	1,091	TBD	TBD	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons	PROJECT 4377
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Program Office Startup		*										
(U) AOA/RDT&E Studies Complete			*									
(U) Prototype Demo				*								
(U) Initial Delivery						X						

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons			PROJECT 4377			
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U)	Eng study/analysis; prototype development & testing			586	0	0				
(U)	Mission support			65	0	0				
(U)	Total			651	0	0				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Lockheed Martin	C/CPAF	29 Jun 97		341		341				341
M-Douglas	C/FFP	May 97		70		70				70
<u>Support and Management Organizations</u>										
ESC	n/a	n/a		n/a		240				240
<u>Test and Evaluation Organizations:</u> Not applicable										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons				PROJECT 4377	
Government Furnished Property: None									
<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development					411				411
Subtotal Support and Management					240				240
Subtotal Test and Evaluation					0				0
Total Project				0	651	0	0	0	651

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons				PROJECT 4495	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4495 Avionics Modernization Program	471	9,160	47,940	0	0	0	0	0	57,571
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification
4495: Avionics Modernization Program: (Formerly called the C-5 All-Weather Flight Control System (AWFCS) Reliability Improvement Program) The C-5 Avionics Modernization Program redesigns the architecture of the avionics system to support the AWFCS Reliability Improvement Program and Global Air Traffic Management (GATM). The AWFCS replaces low reliability Line Replaceable Units (LRUs) in the automatic flight control system and replaces aging mechanical instruments in the engine and flight systems. Current trends indicate some control systems will be unsupported within five years. A GATM capability, which encompasses communications, navigation, and surveillance requirements, will be concurrently incorporated into the aircraft to progress towards "free flight" capability. Integration of Enhanced Ground Proximity Warning System (EGPWS) Nav Safety enhancements is also part of the C-5 AMP (with separate funding). This project was comprised of low technical risk efforts supporting fielded weapons systems and, therefore, was assigned to Budget Activity 7, Operational Systems Development.

(U) FY 1997 (\$ in Thousands):

- (U) 436 Contractor Technical Support
- (U) 35 Mission Support
- (U) \$471 Total

(U) FY 1998 (\$ in Thousands):

- (U) 1,354 System Engineering
- (U) 2,842 Hardware Design
- (U) 3,518 Software Development
- (U) 147 Design Data
- (U) 528 Program Management
- (U) 538 Contractor Technical Support
- (U) 233 Mission Support
- (U) \$9,160 Total

Project 4495 Page 9 of 13 Pages Exhibit R-2 (PE 0401119F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons	PROJECT 4495																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 6,329 System Engineering - (U) 2,936 Hardware Design - (U) 15,589 Software Development - (U) 2,279 Design Data - (U) 2,689 Program Management - (U) 5,600 Prototype Fab/Install - (U) 8,415 System Design Test and Evaluation - (U) 3,209 Pre-Production Fab - (U) 550 Contractor Technical Support - (U) 344 Mission Support - (U) \$47,940 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998 PB)</td> <td style="text-align: center;">471</td> <td style="text-align: center;">9,751</td> <td style="text-align: center;">14,204</td> <td style="text-align: center;">24,426</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">481</td> <td style="text-align: center;">9,751</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional/General Reductions</td> <td style="text-align: center;">-10</td> <td style="text-align: center;">-362</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td style="text-align: center;">-229</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY1998 PB</td> <td></td> <td></td> <td style="text-align: center;">33,736</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/1999 President's Budget</td> <td style="text-align: center;">471</td> <td style="text-align: center;">9,160</td> <td style="text-align: center;">47,940</td> <td style="text-align: center;">57,571</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Since FY98 PB, additional funds (\$33.7M) were added in FY99 to support Global Air Traffic Management (GATM) requirements. Since FY98 PB, FY98 C-5 AMP has been reduced by \$362K for general Congressional reductions and by \$229K for SBIR. Schedule: N/A Technical: N/A</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY1998 PB)	471	9,751	14,204	24,426	(U) Appropriated Value	481	9,751			(U) Adjustments to Appropriated Value					a. Congressional/General Reductions	-10	-362			b. SBIR		-229			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY1998 PB			33,736		(U) Current Budget Submit/1999 President's Budget	471	9,160	47,940	57,571
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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(U) Appropriated Value	481	9,751																																																							
(U) Adjustments to Appropriated Value																																																									
a. Congressional/General Reductions	-10	-362																																																							
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d. Below Threshold Reprogramming																																																									
e. Rescissions																																																									
(U) Adjustments to Budget Years Since FY1998 PB			33,736																																																						
(U) Current Budget Submit/1999 President's Budget	471	9,160	47,940	57,571																																																					
Project 4495	Page 10 of 13 Pages	Exhibit R-2 (PE 0401119F)																																																							

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BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons				PROJECT 4495		
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) PE# 0401119F/C-5 Squadrons										
Aircraft Procurement, AF, BA-5, C-5 Mods, Avionics Modernization Program, BP-11		0	0	0	113,488	53,737	123,324	112,365	196,971	599,885
Aircraft Procurement, AF, BA-5, C-5 Mod, Enhanced Ground Proximity Warning System (EGPWS), BP-11		0	0	5,335	3,890	3,900	4,825	398	0	18,348
(U) <u>PE# 0305099F/Global Air Traffic Management (GATM)</u>										
RDT&E, AF, BA-7		3,000	0	27,056	18,155	10,695	9,776	7,806	TBD	TBD
(U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2
(U) Acquisition Strategy Panel				*						
(U) Draft RFP					X					
(U) Final RFP					X					
(U) Prototype Installation Start								X		
(U) Developmental Test Start (FY00/2)										
(U) Production Installation Start (FY01/2)										
(U) Prod Installation Complete (FY05/2)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons			PROJECT 4495		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	System Engineering				0	1,354	6,329			
(U)	Hardware Design				0	2,842	2,936			
(U)	Software Development				0	3,518	15,589			
(U)	Design Data				0	147	2,279			
(U)	Prototype Fab/Install				0	0	5,600			
(U)	Program Management				0	528	2,689			
(U)	System Design Test and Evaluation				0	0	8,415			
(U)	Pre-Production Fab				0	0	3,209			
(U)	Contractor Technical Support				436	538	550			
(U)	Mission Support				35	233	344			
(U)	Total				471	9,160	47,940			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
SA-ALC/LA	C/CPAF	Sep 98	TBD	59,126	0	471	9,160	47,940	0	57,571
<u>Support and Management Organizations:</u> Not applicable										
<u>Test and Evaluation Organizations:</u> Not applicable										
Project 4495					Page 12 of 13 Pages			Exhibit R-3 (PE 0401119F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401119F C-5 Airlift Squadrons	PROJECT 4495
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Government Furnished Property: None

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development					471	9,160	47,940	0	57,571
Subtotal Support and Management					0	0	0	0	0
Subtotal Test and Evaluation					0	0	0	0	0
Total Project				0	471	9,160	47,940	0	57,571

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401130F C-17 Aircraft	PROJECT 2569
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2569 C-17 Aircraft	71,365	104,568	123,069	154,369	159,266	114,538	111,119	43,050	6,614,894
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	1*

*** Aircraft T-1, FY87 Funded**

(U) A. Mission Description and Budget Item Justification

Airlift provides essential flexibility when responding to contingencies on short notice anywhere in the world. It is a major element of America's national security strategy and constitutes the most responsive means of meeting U.S. mobility requirements. Additional airlift capability is needed for rapid deployment of combat forces in support of national objectives. Specific tasks associated with the airlift mission include deployment, employment (airland and airdrop), sustaining support, retrograde, and combat redeployment. The C-17 can perform the entire spectrum of airlift missions and is specifically designed to operate effectively and efficiently in both strategic and theater environments. The C-17 provides a vast increase in overall airlift capability necessary to replace and exceed the capabilities lost from retiring the aging C-141 fleet from the Air Force inventory. Not only can the C-17 deliver outsize cargo to austere tactical environments, but it also reduces ground time during airland operations. The C-17 will perform the airlift mission well into the 21st century.

This program element is budgeted in Budget Activity 7, Operational System Development, because the program has completed Milestone III and is continuing producibility and performance improvements to support full-rate production and increase the operational capability of the C-17 through programmed modifications.

(U) Acquisition Strategy

The C-17 Acquisition Strategy is based on five separate contracts to support the entire scope of the C-17 weapon system. These five contracts are: 1) a multi-year procurement (MYP) aircraft contract (to economically purchase the full complement of production aircraft) - (APAF); 2) a Producibility Enhancement and Performance Improvement (PE/PI) contract (to develop cost reduction changes, capability enhancements, and design fixes to service-revealed problems) - (RDT&E, AF); 3) a Flexible Sustainment (field support) contract (to support the current and future fielded aircraft) - (APAF); 4) a MYP engine contract (for Government Furnished Equipment [GFE] engines) - (APAF); and 5) an aircrew training systems (ATS) contract (for aircrew training) - (APAF).

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401130F C-17 Aircraft	PROJECT 2569
<p>The Congressionally-mandated Mobility Requirements Study (MRS), initially forwarded to Congress on 23 Jan 92 and updated on 28 Mar 95, validated the need for the C-17 aircraft. Two C-17 Defense Acquisition Board (DAB) decisions, contained in the 3 Nov 95 and 1 Feb 96 USD(A&T) Acquisition Decision Memoranda (ADMs), directed the Air Force to proceed with a 120-aircraft production program and pursue a multi-year procurement for the last 80 aircraft. The FY96 Supplemental Appropriations Act and FY97 Defense Appropriations Act approved a 7-year MYP program. The Air Force is proceeding with an 80-aircraft MYP program (along with engines to support them) to complete a 120-aircraft total purchase at the maximum affordable rate (FY97-03 Quantity: 8-9-13-15-15-5), beginning with the economic order quantity (EOQ) funding in FY96.</p>		
<p>(U) <u>FY 1997 (\$ in Thousands):</u></p>		
<ul style="list-style-type: none"> - (U) 67,665 Continued product improvement development & testing - (U) 2,200 Airframe durability test - (U) 1,500 Producibility Enhancement/Performance Improvement (PE/PI) Government flight test - (U) \$71,365 Total 		
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p>		
<ul style="list-style-type: none"> - (U) 88,068 Continue product improvement development & testing - (U) 5,000 Airframe durability test teardown - (U) 11,500 PE/PI Government flight test - (U) \$104,568 Total 		
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p>		
<ul style="list-style-type: none"> - (U) 105,669 Continue product improvement development & testing - (U) 5,900 Landing Gear durability test and Landing Gear and Aircraft Durability Improvements - (U) 11,500 PE/PI Government flight test - (U) \$123,069 Total 		
Project 2569	Page 2 of 6 Pages	Exhibit R-2 (PE 0401130F)

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401130F C-17 Aircraft	PROJECT 2569
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	71,774	113,605	202,344	6,627,754
(U) Appropriated Value	77,486	110,605		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,632	-3,742		
b. SBIR	-81	-2,295		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-4,289			
e. Rescissions	-119			
(U) Adjustments to Budget Years Since FY 1998 PB			-79,275	
(U) Current Budget Submit/1999 President's Budget	71,365	104,568	123,069	6,614,894

(U) Change Summary Explanation:

Funding: The FY98 funding changes reflect Congressional action decreasing the budget by \$3 million, and undistributed Congressional reductions. The FY99 budget changes reflect reductions to fund other DOD priorities for global mobility.

Schedule: Planned product improvement development and testing was rephased to reflect funding profile changes.

Technical: No changes.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401130F C-17 Aircraft				PROJECT 2569				
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>												
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>			
(U) APAF, MYP, BA02, PE0401130F	2,075,110	2,130,510	2,900,492	3,181,520	3,181,116	3,045,281	1,370,471	223,800	32,137,727			
(U) APAF, Initial Spares, BA06, PE0401130F	5,195	70,710	112,330	187,967	159,016	167,209	167,035	522,300	1,994,547			
(U) APAF, A/C Mods, BA05, PE0401130F	51,834	57,731	45,704	82,516	106,892	119,302	133,747	814,140	1,461,583			
(U) MilCon, Facilities, PE0401130F	80,905	6,470	70,956	29,422					357,253			
(U) D. <u>Schedule Profile</u>												
	<u>FY 1997</u>			<u>FY 1998</u>				<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Acquisition Milestones: Milestone III (1 st Qtr FY96)												
(U) Engineering Milestones: Durability Article Test (3rd Lifetime)												
(U) Contract Milestone Lot IX (8 a/c)	*											
Lot X Adv Proc (9 a/c)		*										
Lot X (9 a/c)				X								
Lot XI Adv Proc (13 a/c)					X							
Lot XI (13 a/c)								X				
Lot XII Adv Proc (15 a/c)									X			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0401130F C-17 Aircraft			PROJECT 2569		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
			<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>					
(U)	Contractor Furnished Engineering & Test		69,765	93,068	111,569					
(U)	Test, Other Government Costs (OGC)		1,600	11,500	11,500					
(U)	Total		71,365	104,568	123,069					
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Douglas Aircraft	C,FPI/FP	8/31/81	5,190,366	5,190,366	5,190,366	0	0	0	0	5,190,366
Douglas Aircraft	C,CPFF	7/13/95	874,253	874,253	81,868	64,765	88,268	111,569	528,492	874,962
Pratt & Whitney	C,FP	5/24/91	25,346	25,346	25,346	0	0	0	0	25,346
Douglas Aircraft	C,FPI	4/14/89	na	na	83,885	0	0	0	0	83,885
Pratt & Whitney	FP+EPA	4/18/95	8,300	8,300	0	5,000	3,300	0	0	8,300

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY					PE NUMBER AND TITLE					PROJECT
7 - Operational System Development					0401130F C-17 Aircraft					2569
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Support and Management Organizations</u>										
Mission Support	OGC PO				97,000	100	100	0	0	97,200
Site Activation	OGC PO				1,500	0	0	0	0	1,500
Miscellaneous	PO				43,435	0	900	0	0	44,335
<u>Test and Evaluation Organizations</u>										
Combined Test Force	PO	Dec 97			196,718	1,500	11,500	11,500	54,000	275,218
Wright Labs/Arnold	PO				10,252	0	0	0	0	10,252
Eng Dev Center										
Other	PO				3,030	0	500	0	0	3,530
Government Furnished Property: None										
Subtotal Product Development					5,381,465	69,765	91,568	111,569	528,492	6,182,859
Subtotal Support and Management					141,935	100	1,000	0	0	143,035
Subtotal Test and Evaluation					210,000	1,500	12,000	11,500	54,000	289,000
Total Project					5,733,400	71,365	104,568	123,069	582,492	6,614,894

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	3,100	5,610	512	511	0	0	0	0	50,633
5120 60K Pound Capacity Aircraft Loader	2,202	0	0	0	0	0	0	0	43,102
5150 Next Generation Small Loader (NGSL)	898	5,610	512	511	0	0	0	0	7,531
Quantity of RDT&E Articles	0	4/\$2,800*	0	0	0	0	0	0	4/\$2,800*

* A total of six NGSL loaders will be procured. Two additional loaders and support procured under OSD Foreign Comparative Test (FCT) Program (\$1,840).

(U) A. Mission Description and Budget Item Justification

This program element contains two projects integral to the Air Force’s ability to mobilize forces and equipment worldwide. The two projects involve testing, developing, and fielding two new aircraft cargo loaders. These new loaders will alleviate critical loader deficiencies and provide the Air Force with a flexible balance of large and small loader capability for the future. The 60K Tunner loader replaces the 40K loader as the strategic aerial port workhorse servicing all military cargo and Civil Reserve Air Fleet (CRAF) aircraft. The NGSL replaces aging 25K loaders and complements the 60K loader fleet by providing increased deployability and cargo handling capacity at smaller, but operationally vital peacetime and contingency airfields. More importantly, the 60K loader and NGSL have a high reach capability required for direct interface with Wide-Body Aircraft (WBA). This improved capability eliminates the current requirement for a fleet of wide-body elevator loader (WBEL) equipment used in conjunction with both the 40K and 25K loaders to service WBA. Starting in FY97, the Air Force realigned the 60K RDT&E funding from PE 0604704F, Common Support Equipment Development, into this dedicated program element, which also contains the 60K procurement funding. The RDT&E and procurement funding for the NGSL has also been aligned to this program element. Acquisition of the NGSL to support operational mobility aircraft requires no significant development effort; therefore, it is categorized as BA-7, operational system development.

(U) Acquisition Strategy:

5120: 60K Pound Capacity Aircraft Loader: The 60K loader program incorporated an approach whereby two manufacturers built two prototypes each to compete in a “drive-off” competition. This competition resulted in a production contract award to a single manufacturer. Development effort completed in FY97.

5150: NGSL: Two Non-Developmental Item (NDI) loader manufacturers will be selected during full and open competition to build three loaders each. Loaders will compete in a “drive-off” competition and the winner will be awarded a follow-on production contract.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)						
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>				
						<u>Cost</u>				
(U) Previous President's Budget (FY1998 PB)		3,145	7,947	522		52,514*				
(U) Appropriated Value		3,212	5,947							
(U) Adjustments to Appropriated Value										
a. Congressional/General Reductions		-67	-225							
b. SBIR			-112							
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming		-40								
e. Rescissions		-5								
(U) Adjustments to Budget Years Since FY1998 PB				-10						
(U) Current Budget Submit/1999 President's Budget		3,100	5,610	512		50,633				
* Note: Total cost was inadvertently reported in FY98 PB as \$12,138.										
(U) Change Summary Explanation:										
Funding: FY98 reflects \$225K in Congressional reductions and \$112K for SBIR. FY97 was reduced \$40K for a below threshold reprogramming (BTR) to Next Generation Heater Program (PE 0708026F).										
Schedule: N/A										
Technical: N/A										
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U) Other Procurement, AF, BA-2, Air Cargo Materiel Handling, PE0401214F		0	81,615	91,720	102,148	79,135	63,796	86,794	TBD	TBD
(U) D. <u>Schedule Profile:</u>										
See individual project R-2 Exhibits for schedule profiles										
<i>Page 2 of 12 Pages</i>						Exhibit R-2 (PE 0401214F)				

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)	PROJECT 5120
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
5120 60K Pound Capacity Aircraft Loader	2,202	0	0	0	0	0	0	0	43,102
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

5120: 60K Pound Capacity Aircraft Loader: This project completed the 60K aircraft transporter/loader development to fulfill Air Mobility Command's (AMC) requirement, as documented in Operational Requirement Document (ORD) 002-89-III. The project provided a single unique loader to replace existing 40K loaders, wide-body elevator loaders, and lower lobe loaders to on/off load various type aircraft including the C-17, C-5, C-141, C-130, C-27, KC-10, and Civil Reserve Air Fleet (CRAF). The 60K loader can be driven on/off the C-17, C-5, and C-141 aircraft without shoring and is the only loading vehicle capable of moving type V airdrop platform carrying a full 60,000 pounds as required by the US Army. The 60K loader is significantly more reliable than the 40K loader and will facilitate a major reduction in deployment preparation time, from 30 manhours to 3 manhours for each loader.

(U) FY 1997 (\$ in Thousands):

- (U) 414 Program Office Support (TDY, Supplies)
- (U) 1,788 Continued contracted advisory and assistance services
- (U) \$2,202 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Total

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BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)			PROJECT 5120			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		<u>Total</u>				
						<u>Cost</u>				
(U) Previous President's Budget (FY1998 PB)		579	0	0		41,479*				
(U) Appropriated Value		592								
(U) Adjustments to Appropriated Value										
a. Congressional/General Reductions		-13								
b. SBIR										
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming		1,623								
e. Rescissions										
(U) Adjustments to Budget Years Since FY1998 PB										
(U) Current Budget Submit/1999 President's Budget		2,202	0	0		43,102				
* Note: Total cost was inadvertently reported in FY98 PB as \$579.										
(U) Change Summary Explanation:										
Funding: FY97 \$1,623K realigned from NGS� program (Project 5150) for contract advisory and assistance services in support of program restructure and \$13K for Congressional reductions.										
Schedule: N/A										
Technical: N/A										
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U) Other Procurement, AF, BA-2, Air Cargo Materiel Handling, PE0401214F		0	81,615	91,720	82,358	35,633	4,367	2,925	TBD	TBD

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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)	PROJECT 5120
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(U) **D. Schedule Profile**

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Complete IOT&E					X							
(U) Milestone III							X					
(U) IOC								X				

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BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)				PROJECT 5120	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Program Management Support				414					
(U)	Advisory and assistance services				1,788					
(U)	Total				2,202	0	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
WR-ALC/LEA					40,900	0	0	0	0	40,900
<u>Support and Management Organizations:</u>										
Modern Technologies Corp (MTC)	SS/Indefinite Delivery	12 Jun 97			0	1,637	0	0	0	1,637
WR-ALC/LEA	Indefinite Quantity				0	565	0	0	0	565
<u>Test and Evaluation Organizations:</u> Not applicable										
Government Furnished Property: None										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)	PROJECT 5120
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				40,900	0	0	0	0	40,900
Subtotal Support and Management				0	2,202	0	0	0	2,202
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				40,900	2,202	0	0	0	43,102

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)	PROJECT 5150
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
5150 Next Generation Small Loader (NGSL)	898	5,610	512	511	0	0	0	0	7,531
Quantity of RDT&E Articles	0	4/\$2,800*	0	0	0	0	0	0	4/\$2,800*

* A total of six NGSL loaders will be procured. Two additional loaders and support procured under OSD Foreign Comparative Test (FCT) Program (\$1,840).

(U) A. Mission Description and Budget Item Justification

5150: Next Generation Small Loader: The NGSL (25K to 35K pound capacity) program supports acquisition and delivery of 264 loaders that, with the 60K loader, will form the backbone of the Global Reach airlift 463-L (pallet) movement system. Upgrading the current loader fleet with the NGSL will correct the critical high-reach shortcomings of existing 25K loaders and will provide increased flexibility to ensure the Air Force meets its global mobility commitments.

Currently, the Air Force uses a 30-year old 25K loader with an extremely low mean time between failure (approx. 10 hours). Additionally, the 25K pound loader lacks high reach capability and requires a separate wide body elevator loader (a fixed high lift transfer platform) to off/on load KC-10 and Civil Reserve Air Fleet (CRAF) Wide-Body Aircraft (WBA). The NGSL will replace the aging 25K pound loader and wide-body elevator loaders, providing the Department of Defense with a single, reliable cargo handling system that can reach the deck heights of the KC-10 and CRAF WBA and can lower to the C-130 deck height. Additionally, the smaller NGSL will be air transportable on the C-130, allowing worldwide deployment to contingency airfields.

The NGSL program will select two Non-Developmental Item (NDI) loader manufacturers to build three loaders each. Loaders will compete in a “drive-off” competition, and the winner will be awarded a follow-on production contract.

(U) FY 1997 (\$ in Thousands):

- (U) 598 Operational Assessment of Commercial Off-the-Shelf (COTS) Loaders
- (U) 300 Program management support
- (U) \$898 Total

(U) FY 1998 (\$ in Thousands):

- (U) 5,100 Acquire and test Non-Developmental Item (NDI) test articles
- (U) 510 Program management support
- (U) \$5,610 Total

(U) FY 1999 (\$ in Thousands):

- (U) 512 Program management support
- (U) \$512 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)	PROJECT 5150
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	2,566	7,947	522	11,559
(U) Appropriated Value	2,620	5,947		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-54	-225		
b. SBIR		-112		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	-1,663			
e. Rescissions	-5			
(U) Adjustments to Budget Years Since FY1998 PB			-10	
(U) Current Budget Submit/1999 President's Budget	898	5,610	512	7,531

(U) Change Summary Explanation:

Funding: FY97 \$1,623K realigned to 60K loader (Project 5120) and \$40K below threshold reprogramming (BTR) to Next Generation Heater Program (PE 0708026F), and \$5K for rescissions. FY98 reflects \$225K in Congressional reductions and \$112K for SBIR.

Schedule: N/A

Technical: N/A

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)	PROJECT 5150
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(U) **C. Other Program Funding Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement, AF, BA-2, Air Cargo Materiel Handling, PE0401214F	0	0	0	19,790	43,502	59,429	83,869	0	206,590

(U) **D. Schedule Profile**

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1
(U) Quick Look Assessment (completion)		*							
(U) Test article contract award								X	
(U) Competitive drive-off (start)									X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)			PROJECT 5150		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Operational Assessment of COTS Loaders				598	0	0			
(U)	Acquire and test Non-Developmental Item (NDI) test articles				0	5,100	0			
(U)	Provide program management support				300	510	512			
(U)	Total				898	5,610	512			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations:</u>										
WR-ALC/LEA	FFP/PR	FY98/2			0	598	5,610	512	511	7,231
<u>Support and Management Organizations:</u>										
Technical Support Contract					0	300	0	0	0	300
<u>Test and Evaluation Organizations:</u> Not applicable										
Government Furnished Property: None										
Project 5150					Page 11 of 12 Pages			Exhibit R-3 (PE 0401214F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401214F Air Cargo Materiel Handling (463-L)	PROJECT 5150
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				0	598	5,610	512	511	7,231
Subtotal Support and Management				0	300	0	0	0	300
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				0	898	5,610	512	511	7,531

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401218F KC-135 Squadrons
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	714	1,863	11,093	2,310	501	498	505	Continuing	Continuing
4286 Multipoint*	0	0	9,423	0	0	0	0	0	9,423
4403 Airborne Broadcast Intelligence (ABI) KC-135	714	0	0	0	0	0	0	0	714
4494 KC-135 Aging Aircraft Program	0	1,863	1,670	2,310	501	498	505	Continuing	Continuing
Quantity of RDT&E Articles	2/\$500	0	1/\$5,000	0	0	0	0	0	3/\$5,500

* The only funds budgeted for this project in FY99 are for CINC Support Aircraft Study.

(U) A. Mission Description and Budget Item Justification

4286: CINC Support Aircraft Study: Air Mobility Command (AMC) is the lead command for Commander-in-Chief (CINC) Support aircraft issues. The existing CINC Support aircraft fleet suffers from high airframe hours, corrosion, and outdated navigation and communication systems. Support costs continue to escalate because each aircraft is unique and increasingly unsupportable. The acquisition strategy is to develop and prototype the communications architecture necessary to support the warfighting CINC's on a KC-135R. The architecture must meet DoDD 4660.3 and MCM 131-46 requirements and includes: JCS communications baseline suite, an integrated Communications Management System (CMS), and a state-of-the-art, high-throughput communications backbone which provides for "plug-and-play" capability for specialized pieces of communications equipment. This aircraft will be used to determine the production configuration of subsequent CINC support aircraft. Contract will be competitively awarded. The project comprises low technical risk efforts supporting fielded weapon systems or Commercial-Off-The-Shelf (COTS) acquisition and, therefore, is assigned to Budget Activity 7, Operational Systems Development. A permanent BPAC will be assigned at a later date.

4403: Airborne Broadcast Intelligence (ABI): The Air Mobility Command (AMC) Airlift and Air Refueling Mission Area Plans identify a deficiency in the ability to protect aircraft from hostilities during combat operations. ABI addresses this deficiency and increases air crew survivability by providing aircrews with portable, on-aircraft mission equipment to receive and display critical, real-time intelligence information. Strategic mobility aircrews often fly extended missions or transit enroute stations without full intelligence information capability. Information provided prior to mission departure is often outdated or incomplete upon arrival in theater. ABI provides increased threat situational awareness and enables aircrews to make mission modifications to avoid enemy threats under rapidly changing combat conditions. To limit system implementation costs, it is envisioned that ABI will be "snapped-on" to any AMC mobility fleet aircraft when this capability is needed. These systems are intended to be transferred between KC-135, KC-10, C-141, C-5, and C-17 operational wings, as required. This project is an FY97 new start to modify and integrate on the KC-135 previously developed intelligence communication and display equipment to meet AMC requirements. Two RDT&E test articles will be procured in FY97, with delivery in FY98. This project comprises low technical risk efforts supporting fielded weapons systems and, therefore, is assigned to Budget Activity 7, Operational Systems Development.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401218F KC-135 Squadrons	
<p><u>4494: KC-135 Aging Aircraft Program</u>: This program, in part, supports the aging aircraft corrosion and fatigue project CORAL REACH. CORAL REACH studies include the analysis and testing efforts in the area of aging aircraft, to include corrosion, fatigue, and stress corrosion cracking. The USAF will utilize CORAL REACH activities to improve KC-135 Programmed Depot Maintenance efficiency and to provide direction for future aging aircraft efforts to maintain the KC-135 as a viable airframe. CORAL REACH results provide accurate data for incorporation into the KC-135 Economic Life Study planned for FY00. The KC-135 Economic Life Study consists of studies for structure, systems, and component support as well as cost benefit analyses to support an Analysis of Alternatives (AOA). The AOA addresses replacement schedules for the KC-135 based on economic decision points. This effort is a low technical risk effort supporting a fielded weapon system and, therefore, is assigned to Budget Activity 7, Operational Systems Development.</p> <p>(U) <u>Acquisition Strategy:</u></p> <p><u>4286: CINC Support Aircraft Study</u>: The acquisition strategy is to develop and prototype the communications architecture necessary to support the Warfighting CINC on a KC-135R. This aircraft will be used to determine the production configuration of subsequent CINC support aircraft.</p> <p><u>4403: Airborne Broadcast Intelligence (ABI)</u>: The acquisition strategy for ABI was to re-utilize software and non-developmental hardware already prototyped in a competitive, fixed-price, contract award environment.</p> <p><u>4494: KC-135 Aging Aircraft Program</u>: The acquisition strategy consists primarily of separate task orders (with separate statements of work) ranging from fixed price to cost plus contracts. These task orders address a myriad of aging aircraft activities against existing contract vehicles, such as the SPO-managed KC-135 Fleet Support Contract and Design Engineering Program contracts managed through the Air Logistics Centers.</p>		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development		PE NUMBER AND TITLE 0401218F KC-135 Squadrons		
(U) B. <u>Program Change Summary (\$ in Thousands)</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	715	1,992	1,704	cont
(U) Appropriated Value	757	1,992		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-23	-90		
b. SBIR	-19	-39		
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-1			
(U) Adjustments to Budget Years Since FY 1998 PB			9,389	cont
(U) Current Budget Submit/1999 President's Budget	714	1,863	11,093	cont
 (U) Change Summary Explanation:				
Funding: In FY98, KC-135 Aging Aircraft Program funds were integrated with the former KC-135 Economic Life Study BPAC that had \$959K in FY00. Since FY98 PB, FY98 Aging Aircraft program has been reduced by \$90K for general Congressional reductions and by \$39K for SBIR.				
Schedule: N/A				
Technical: N/A				

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401218F KC-135 Squadrons
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) <u>PE# 0401218F/KC-135 Squadrons</u>									
(U) Aircraft Procurement, AF, BA-7, KC-135 CINC Aircraft, BP-11				29,154	46,545				75,699
(U) Aircraft Procurement, AF, BA-7 Other Production Charges, ABI, BP-19		1,490	1,505	1,501	1,460	1,486	1,453	0	8,895
(U) Operations & Maintenance, AF, BA-2 Mobilization, ABI		1,000	1,019	1,050	1,071	1,091	TBD	TBD	TBD
(U) <u>PE# 0401119F/C-5 Squadrons</u>									
(U) RDT&E, AF, BA-7 Operational Systems Development, ABI	651								651
(U) Aircraft Procurement, AF, BA-7 Other Production Charges, ABI, BP-19		1,483	1,381	1,428	1,455	1,310	1,282	0	8,339

(U) D. Schedule Profile

	<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>					
(U) CINC Support Aircraft	1	2	3	4	1	2	3	4	1	2	3	4
(U) Airborne Broadcast Intelligence (ABI)												
(U) KC-135 Aging Aircraft Program												

See Individual R-2 Exhibits for Schedule Profiles

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998					
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401218F KC-135 Squadrons				PROJECT 4286				
COST (\$ In Thousands)				FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4286 Multipoint*				0	0	9,423	0	0	0	0	0	9,423
Quantity of RDT&E Articles				0	0	1/\$5,000	0	0	0	0	0	1/\$5,000

* The only funds budgeted for this project in FY99 are for CINC Support Aircraft Study.

(U) A. Mission Description and Budget Item Justification

Air Mobility Command (AMC) is the lead command for Commander-in-Chief (CINC) Support aircraft issues. The existing CINC Support aircraft fleet suffers from high airframe hours, corrosion, and outdated navigation and communication systems. Support costs continue to escalate because each aircraft is unique and increasingly unsupportable. The acquisition strategy is to develop and prototype the communications architecture necessary to support the warfighting CINC's on a KC-135R. The architecture must meet DoDD 4660.3 and MCM 131-46 requirements and includes: JCS communications baseline suite, an integrated Communications Management System (CMS), and a state-of-the-art, high-throughput communications backbone which provides for "plug-and-play" capability for specialized pieces of communications equipment. This aircraft will be used to determine the production configuration of subsequent CINC support aircraft. Contract will be competitively awarded. The project comprises low technical risk efforts supporting fielded weapon systems or Commercial-Off-The-Shelf (COTS) acquisition and, therefore, is assigned to Budget Activity 7, Operational Systems Development.

(U) FY 1997 (\$ in Thousands):

- (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$7,000 Communications equipment- INMARSAT, Console, Switch, STU III, UHF, VHF, Mil SATCOM, Data Communications
- (U) \$800 Installation
- (U) \$1,300 Testing
- (U) \$323 Program Management
- (U) \$9,423 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY	PE NUMBER AND TITLE						PROJECT			
7 - Operational System Development	0401218F KC-135 Squadrons						4286			
(U) B. <u>Program Change Summary (\$ in Thousands)</u>										
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u>						
	0	0	0	0						
(U) Previous President's Budget (FY 1998 PB)										
(U) Appropriated Value										
(U) Adjustments to Appropriated Value										
a. Congressional/General Reductions										
b. SBIR										
c. Omnibus or Other Above Threshold Reprogram										
d. Below Threshold Reprogramming										
e. Rescissions										
(U) Adjustments to Budget Years Since FY 1998 PB			+9,423							
(U) Current Budget Submit/1999 President's Budget			9,423	9,423						
 (U) Change Summary Explanation:										
Funding: Since FY98 PB, \$9,423K was added for CINC Support Aircraft, FY99 new start.										
Schedule:										
Technical:										
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>FY 2004</u>	<u>To</u>	<u>Total</u>
									<u>Compl</u>	<u>Cost</u>
(U) PE# 0401218F/KC-135 Squadrons										
(U) Aircraft Procurement, AF, BA-7, KC-135 CINC Aircraft, BP-11				29,154	46,545					75,699
 (U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>			<u>FY 1998</u>			<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2
(U) Communications Prototype Complete (4Q/FY00)										
(U) Prototype Demo (4Q/FY00)										
 Project 4286										
Page 6 of 18 Pages										
Exhibit R-2 (PE 0401218F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401218F KC-135 Squadrons	PROJECT 4286
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Communications equipment			7,000
(U) Installation			800
(U) Testing			1,300
(U) Program Management, Engineering Change Orders			323
(U) Total			9,423

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Product Development Organizations

ASC	TBD	TBD	TBD	TBD	0	0	0	7,800	0	7,800
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Support and Management Organizations

TBD								323		323
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Test and Evaluation Organizations

TBD								1,300		1,300
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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401218F KC-135 Squadrons				PROJECT 4286		
<u>(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>										
Government Furnished Property: TBD										
<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget FY 2000</u>	<u>Budget to Complete</u>	<u>Total Program</u>	
Subtotal Product Development						7,800	0	0	7,800	
Subtotal Support and Management						323	0	0	323	
Subtotal Test and Evaluation						1,300	0	0	1,300	
Total Project						9,423	0	0	9,423	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401218F KC-135 Squadrons				PROJECT 4403	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4403 Airborne Broadcast Intelligence (ABI) KC-135	714	0	0	0	0	0	0	0	714
Quantity of RDT&E Articles	2/\$500	0	0	0	0	0	0	0	2/\$500

(U) A. Mission Description and Budget Item Justification

The Air Mobility Command (AMC) Airlift and Air Refueling Mission Area Plans identify a deficiency in the ability to protect aircraft from hostilities during combat operations. The Airborne Broadcast Intelligence (ABI) system addresses this deficiency and increases aircrew survivability by providing aircrews with portable, on-aircraft mission equipment to receive and display critical, real-time intelligence information. Strategic mobility aircrews often fly extended missions or transit enroute stations without full intelligence information capability. Information provided prior to mission departure is often outdated or incomplete upon arrival in theater. ABI provides increased threat situational awareness and enables aircrews to make mission modifications to avoid enemy threats under rapidly changing combat conditions. To limit system implementation costs, ABI will “snap-on” to any AMC mobility fleet aircraft when this capability is needed. These systems are intended to be transformed between KC-135, KC-10, C-141, C-5, and C-17 operational wings, as required. This project is an FY97 new start to modify and integrate on the KC-135 previously developed intelligence communication and display equipment to meet AMC requirements. USAF will procure two RDT&E test articles in FY97, with delivery in FY98. This project comprises low technical risk efforts supporting fielded weapons systems and, therefore, is assigned to Budget Activity 7, Operational Systems Development.

(U) FY 1997 (\$ in Thousands):

- (U) 200 Engineering study/analysis; prototype development, modification, retrofit, and qualification/certification testing
- (U) 502 Software development
- (U) 12 Mission support
- (U) \$714 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$0 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$0 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401218F KC-135 Squadrons	PROJECT 4403
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY1998 PB)	715	0	0	715
(U) Appropriated Value	757			
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-23			
b. SBIR	-19			
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming				
e. Rescissions	-1			
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) Current Budget Submit/1999 President's Budget	714	0	0	714

(U) Change Summary Explanation:

Funding: N/A

Schedule: N/A

Technical: N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401218F KC-135 Squadrons				PROJECT 4403		
(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>										
		<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	To <u>Compl</u>	Total <u>Cost</u>
(U) <u>PE# 0401218F/KC-135 Squadrons</u>										
(U) Aircraft Procurement, AF, BA-7										
Other Production Charges, ABI, BP-19										
(U) Operations & Maintenance, AF, BA-2										
Mobilization, ABI										
			1,490	1,505	1,501	1,460	1,486	1,453	0	8,895
			1,000	1,019	1,050	1,071	1,091	TBD	TBD	TBD
(U) <u>PE# 0401119F/C-5 Squadrons</u>										
(U) RDT&E, AF, BA-7										
Operational Systems Development, ABI										
		651								651
(U) Aircraft Procurement, AF, BA-7										
Other Production Charges, ABI, BP-19										
			1,483	1,381	1,428	1,455	1,310	1,282	0	8,339
(U) D. <u>Schedule Profile</u>										
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>				
	1	2	3	4	1	2	3	4	1	2
			*							
(U) AOA/RDT&E Studies Complete										
(U) Certification/Qualification Testing										
(U) Prototype Demo										
(U) Integration (Deliverables to Unit)										
				X	X	X	X	X	X	X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0401218F KC-135 Squadrons			PROJECT 4403		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Engineering study/analysis, prototype development & testing				200					
(U)	Software development				502					
(U)	Mission support				12					
(U)	Total				714	0	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Lockheed Martin Command & Control Systems	C/CPAF	29 June 97		702		702	0	0	0	702
<u>Support and Management Organizations</u>										
ESC	n/a	n/a		12		12	0	0	0	12
<u>Test and Evaluation Organizations:</u> Not applicable										
Project 4403					Page 12 of 18 Pages			Exhibit R-3 (PE 0401218F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401218F KC-135 Squadrons	PROJECT 4403
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(U) B. Budget Acquisition History and Planning Information Continued (\$ in Thousands)

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Government Furnished Property: None

Subtotal Product Development					0	702	0	0	0	702
Subtotal Support and Management					0	12	0	0	0	12
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					0	714	0	0	0	714

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0401218F KC-135 Squadrons				PROJECT 4494		
COST (\$ In Thousands)		FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4494	KC-135 Aging Aircraft Program	0	1,863	1,670	2,310	501	498	505	Continuing	Continuing
Quantity of RDT&E Articles		0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program, in part, supports the aging aircraft corrosion and fatigue project CORAL REACH. CORAL REACH studies include the analysis and testing efforts in the area of aging aircraft, to include corrosion, fatigue, and stress corrosion cracking. The USAF will utilize CORAL REACH activities to improve KC-135 Programmed Depot Maintenance efficiency and to provide direction for future aging aircraft efforts to maintain the KC-135 as a viable airframe. CORAL REACH results provide accurate data for incorporation into the KC-135 Economic Life Study planned for FY00. The KC-135 Economic Service Life Study consists of studies for structure, systems, and component support as well as cost benefit analyses to support an Analysis of Alternatives (AOA). The AOA addresses replacement schedules for the KC-135 based on economic decision points. This effort is a low technical risk effort supporting a fielded weapon system and, therefore, is assigned to Budget Activity 7, Operational Systems Development.

(U) FY 1997 (\$ in Thousands):

– (U) \$0 Total

(U) FY 1998 (\$ in Thousands):

- (U) 41 Corrosion/crack growth rate and fatigue determination and testing
- (U) 107 Basic materials test and predictive technique
- (U) 1,415 Functional Systems Integrity Program (FSIP)
- (U) 300 Mission support/contractor support
- (U) \$1,863 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401218F KC-135 Squadrons	PROJECT 4494																																																								
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) 100 Corrosion/crack growth rate and fatigue determination and testing - (U) 495 Functional Systems Integrity Program (FSIP) - (U) 966 Market survey and system cost estimates - (U) 109 Mission support/contractor support - (U) \$1,670 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY1998 PB)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1,992</td> <td style="text-align: center;">1,704</td> <td style="text-align: center;">continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td></td> <td style="text-align: center;">1,992</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional/General Reductions</td> <td></td> <td style="text-align: center;">-90</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td style="text-align: center;">-39</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-34</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/1999 President's Budget</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1,863</td> <td style="text-align: center;">1,670</td> <td style="text-align: center;">continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: In FY98, KC-135 Aging Aircraft Program funds were integrated with the former KC-135 Economic Life Study BPAC (project 4494) that had \$959K in FY00. Since FY98 PB, FY98 Aging Aircraft program has been reduced \$90K for general Congressional reductions and \$39K for SBIR. FY99 Aging Aircraft program has been reduced \$34K for inflation adjustments.</p> <p>Schedule: N/A</p> <p>Technical: N/A</p>					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY1998 PB)	0	1,992	1,704	continuing	(U) Appropriated Value		1,992			(U) Adjustments to Appropriated Value					a. Congressional/General Reductions		-90			b. SBIR		-39			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB			-34		(U) Current Budget Submit/1999 President's Budget	0	1,863	1,670	continuing
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																						
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Project 4494	Page 15 of 18 Pages	Exhibit R-2 (PE 0401218F)																																																								

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0401218F KC-135 Squadrons	PROJECT 4494
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(U) C. Other Program Funding Summary (\$ in Thousands): Not applicable

(U) D. Schedule Profile

	FY 1997				FY 1998				FY 1999			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) Corrosion & Fatigue Testing			*									
(U) Materials Test & Predictive Tech.			*									
(U) FSIP		*										
(U) Mission Support		*										
(U) Begin Market Survey										X		

Note: Activities are on-going

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0401218F KC-135 Squadrons			PROJECT 4494		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Corrosion/crack growth determination and testing				0	41	100			
(U)	Basic materials test and predictive technique					107	0			
(U)	Functional Systems Integrity Program (FSIP)					1,415	495			
(U)	Market survey and system cost estimates					0	966			
(U)	Mission support/contractor support					300	109			
(U)	Total				0	1,863	1,670			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
<u>Contractor or Government Performing Activity</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Performing Activity EAC</u>	<u>Project Office EAC</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Organizations</u>										
Boeing	C/KC-135 Fleet Support SS/FFP	Oct 97-Mar 99	TBD	TBD	400	0	1,715	704	continuing	continuing
<u>Support and Management Organizations</u>										
ARINC, Frontier, other support contractors	Design Engineering Program (DEP) C/FP	Oct 97-Mar 99			0	0	148	966	continuing	continuing
Project 4494					Page 17 of 18 Pages			Exhibit R-3 (PE 0401218F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0401218F KC-135 Squadrons				PROJECT 4494	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
(U) B. <u>Budget Acquisition History and Planning Information Continued (\$ in Thousands)</u>										
<u>Test and Evaluation Organizations</u>										
FAA, Wright Labs, etc.	Project Order/MPIR	Oct 97-Mar 99			100	0	0	0	continuing	continuing
Government Furnished Property: None										
Subtotal Product Development					400	0	1,715	704	continuing	continuing
Subtotal Support and Management					0	0	148	966	continuing	continuing
Subtotal Test and Evaluation					100	0	0	0	continuing	continuing
Total Project					500	0	1,863	1,670	continuing	continuing

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0702207F Depot Maintenance (Non-If)	PROJECT 3326
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3326 Precision Measurement & Calibration	1,375	1,482	1,530	1,566	1,602	1,629	1,667	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program develops, tests, and evaluates national and Air Force measurement standards and calibration equipment in support of all Air Force programs and activities, including over 120 base Precision Measurement Equipment Laboratories (PMELs) worldwide. Metrology research and development provides technology to support systems in all phases of development and acquisition, as well as Air Force R&D laboratories, test ranges, ground test facilities, and operational weapons systems support. Rapidly changing technology requires continuing research and development of measurement standards and calibration equipment to ensure modern weapon systems meet Air Force readiness objectives. This program addresses all metrology disciplines and includes the technology areas of laser, infrared, microwave, millimeter wave, optical, physical, mechanical, electrical, electronic, and ionizing radiation measurements.

Metrology is a technical discipline devoted to the science of measurements and to the study and improvement of measurement technology. Measurements are the foundation of military system development, quality assurance, hardware conformance testing and system readiness tests. The integrity of these tests is assured through calibration and traceability assurance schemes. The capability to measure and calibrate must parallel the emergence of new technology, new ranges, and new capabilities of military systems. Lack of new measurement capability impedes or blocks the successful exploitation of new technologies, especially in the movement from development laboratory to production to deployment. R&D efforts are essential within the DoD to pace these requirements, otherwise, these same new systems will suffer time delays, excessive cost, and increased risk due to unreliable test results in all phases of development, production, deployment and operation. This program is in budget activity 7 - Operational System Development because it supports operational systems.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0702207F Depot Maintenance (Non-If)	PROJECT 3326
<p><u>Acquisition Strategy:</u></p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$750 Completed development of radiance and irradiance detector standards and continued development of an enhanced electrical substitution radiometer, tunable lasers for radiometry, an improved blackbody pyrometer and other national measurement standards to support Air Force infrared / laser / electro-optical weapon systems and support equipment. - (U) \$410 Continued development of microwave standards for noise figure measurements, radar cross-section test range measurements, and high power standards to support radar and radio frequency (RF) communication systems. - (U) \$165 Continued development of national standards for electrical resistance and high speed pulse measurements to support high accuracy electronic test equipment. - (U) \$50 Continued development of national standards and National Institute of Standards and Technology (NIST) traceability for calibration of ionizing radiation hazard instrumentation. - (U) \$1,375 Total <p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$762 Complete development of an improved blackbody calibrator for the AF Primary Standards Laboratory, an enhanced electrical substitution radiometer, a pyroelectric radiometer, and an improved blackbody pyrometer; and begin development of a portable cryogenic radiometer to support infrared test chambers. Continue development of other national measurement standards to support Air Force infrared / laser / electro-optical weapon systems and support equipment. - (U) \$240 Complete high power standards and continue development of microwave standards for noise figure measurements and radar cross-section test range measurements to support radar and RF communication systems. - (U) \$150 Begin development of methods to characterize micro-electromechanical sensors (MEMS) and continue development of improved methods to reduce coordinate measuring machine (CMM) measurement uncertainty. - (U) \$180 Begin development of methods to determine the frequency response characterization of capacitors. Continue development of national standards for electrical resistance and development of high speed pulse measurements to support high accuracy electronic test equipment. - (U) \$65 Begin large area source metrology project, and continue to develop national standards and NIST traceability for calibration of ionizing radiation hazard instrumentation. - (U) \$1,397 Total 		
Project 3326	Page 2 of 6 Pages	Exhibit R-2 (PE 0702207F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0702207F Depot Maintenance (Non-If)	PROJECT 3326
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$785 Complete the development of tunable lasers for radiometry and detector standards for long wavelength infrared measurements; and continue development of other national measurement standards to support Air Force infrared / laser / electro-optical weapon systems and support equipment. - (U) \$280 Continue development of standards for radar support, RF communications systems, and radar cross-section range measurements. - (U) \$150 Complete development of methods to characterize micro-electromechanical sensors (MEMS) and continue development of improved calibration support for coordinate measuring machine (CMMs). - (U) \$220 Begin development of transportable high value resistance standards and continue development of standards for electrical measurements to support high accuracy electronic test equipment. - (U) \$65 Complete beta measurement traceability project and continue large area source metrology project and the development of national standards for calibration of ionizing radiation hazard instrumentation. - (U) \$1,500 Total 		
Project 3326	<i>Page 3 of 6 Pages</i>	Exhibit R-2 (PE 0702207F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0702207F Depot Maintenance (Non-If)	PROJECT 3326
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Develop Measurement Standards & Calibration Support	1,354	1,370	1,472
(U) Travel	21	27	28
(U) Total	1,375	1,397	1,500

(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)

Performing Organizations:

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
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Product Development Organizations

National Institute of Standards & Technology	MIPR (DD FORM 448)	1st QTR	TBD	TBD	10,914	1,354	1,370	1,472	Continue	TBD
AFMC	In House	Various	TBD	TBD	98	21	27	28	Continue	TBD

Support and Management Organizations

Test and Evaluation Organizations

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0702207F Depot Maintenance (Non-If)	PROJECT 3326
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Government Furnished Property: N/A

<u>Item Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
Subtotal Product Development				11,012	1,375	1,397	1,500	Continue	TBD
Subtotal Support and Management				0	0	0	0	0	0
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				11,012	1,375	1,397	1,500	Continue	TBD

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708011F Industrial Preparedness	PROJECT 2865
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2865 Industrial Preparedness-Manufacturing Technology	48,615	45,020	50,997	52,758	54,498	55,162	55,850	0	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** The Manufacturing Technology (ManTech) program is a corporate Air Force program that establishes and demonstrates advancements in manufacturing process technologies, manufacturing engineering systems, and industrial practices, and transitions these advancements into weapon systems design, development, acquisition, and/or sustainment. ManTech provides cost reduction processes and practices and new manufacturing capabilities applicable to existing as well as new weapon systems under development. ManTech strives to make superior mission enabling technologies an affordable life cycle reality by expanding access to a capable, responsible, multi-use industrial base with efficiencies comparable to world class enterprises. Program efforts accelerate shop floor manufacturing process maturation, at every stage of development, through increased emphasis on cost, time, and quality risks in transition. Best processes are evaluated and adapted for application. Where mature processes are not available, laboratory-developed initial process capabilities are matured and inserted into weapon system programs. ManTech goes beyond just factory floor manufacturing/repair processes and encompasses every activity within an industrial enterprise, ranging from above the shop floor activities, including tools for integrated product process development (IPPD), to supplier base interactions and performance. The strategies and best practices of world-class enterprises are analyzed and the performance of defense suppliers benchmarked. The world's best industrial practices are adapted and validated in multiple pilot projects and deployed in defense applications. Project efforts address and target all industry levels, from large prime contractors to small material and parts vendors. Program efforts also enhance the organic repair/remanufacture capability to affordably sustain the aging weapon systems inventory. This program is in Budget Activity 7, Operational System Development, because it provides support to systems in production and/or operational use.

(U) **Acquisition Strategy:** All major contracts in this Program Element were awarded after full and open competition.

(U) **FY 1997 (\$ in Thousands):**

- (U) \$35,065 Established and demonstrated cost-effective and efficient manufacturing technologies for critical, high quality, reliable structural, propulsion, and electronic components and assemblies required for existing and next generation aircraft. Conducted pilot efforts in high-payoff endeavors aimed at validating potential benefits from flexible manufacturing, commercial/military integration, quality processing, and supplier improvements. Conducted long-term projects focused on IPPD tools.
 - (U) Initiated effort to validate revolutionary concepts for manufacture of "all composite" vehicles at a cost of 50% of alternate structures.
 - (U) Continued effort to reduce investment casting manufacturing costs by 50%, focusing on the gas turbine engine supplier base.
 - (U) Completed effort for affordable production of multifunctional radomes for fighters, achieving a 30% manufacturing cost reduction.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0708011F Industrial Preparedness	2865
<ul style="list-style-type: none"> - (U) \$7,280 Established and demonstrated cost-effective repair and remanufacture technologies to affordably sustain existing weapon systems and to enhance mission readiness. Reduced repair and maintenance cycle time for aging systems and established remanufacturing capabilities able to rapidly generate standardized replacement parts on demand. <ul style="list-style-type: none"> - (U) Completed effort to provide Air Logistics Centers (ALCs) with the tools needed to prepare spare parts procurement packages. - (U) Established metal forming simulation remanufacturing processes for logistics centers to generate standardized replacement structures. - (U) Initiated nondestructive inspection efforts (moisture detection, large area disbonds, and filmless radiography) for aging aircraft. - (U) Completed effort to enable the ALCs to efficiently design and develop composite secondary structure by providing an automated drafting and analysis capability. - (U) \$3,405 Established and demonstrated efficient and cost-effective manufacturing methods for high performance, high reliability electronics, lightweight structures, and efficient propulsion methods for advanced tactical missiles. Established manufacturing improvements required to transition precision guided munitions subsystems into production. Conducted pilot efforts in high-payoff endeavors aimed at validating potential benefits accrued from inserting best practices in production of weapon systems. <ul style="list-style-type: none"> - (U) Completed effort to establish manufacturing processes capable of producing affordable tactical grade fiber optic gyroscopes in support of missiles. - (U) Initiated efforts to enable the affordable manufacture of ballistic wind sensors for use in munitions targeting and/or wind shear detection systems. - (U) Continued programs to implement lean benchmarking findings by demonstrating a modular factory approach to the manufacture of missile components. - (U) \$2,865 Established and demonstrated affordable, flexible manufacturing processes to reduce the cost and lead time of higher performance spacecraft and launch vehicles. Established effective and efficient manufacturing technology for critical high quality, reliable electronic components and assemblies required for surveillance, tracking communications links, and data/signal processing. Conducted pilot efforts in high-payoff endeavors aimed at providing efficient, low-cost capability to produce components and weapon systems in the space, launch, and Command, Control, Communications, and Intelligence (C3I) industrial base sectors. <ul style="list-style-type: none"> - (U) Continued process refinement phase of effort to establish manufacturing processes for affordable power efficient, space-qualified multi-bandgap solar cells. - (U) Initiated activity defining benchmarking approach for applying lean principles to space and launch industry sector. - (U) \$48,615 Total 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708011F Industrial Preparedness	PROJECT 2865
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$34,120 Establish and demonstrate cost-effective and efficient manufacturing technologies for critical, high quality, reliable structural, propulsion, and electronic components and assemblies required for existing and next generation aircraft. Conduct pilot efforts in high-payoff endeavors aimed at validating potential benefits accrued from flexible manufacturing, commercial military integration, quality processing, and supplier improvements. Conduct long-term projects focused on integrated product process development (IPPD) tools. <ul style="list-style-type: none"> - (U) Complete pilot efforts to demonstrate manufacture of military electronic components on a commercial line and to incorporate best commercial practices into defense production facilities. - (U) Complete effort of the Design and Manufacture of Low-Cost Composite Engine parts. - (U) Continue the Lean Aircraft Initiative to reduce non-value-added activities across the manufacturing enterprise. - (U) Continue the Composites Affordability Initiative to manufacture composite structures affordably. - (U) Initiate the Lean Implementation project focused on supply chain processes and practices. - (U) \$6,545 Establish and demonstrate cost-effective repair and manufacturing technologies for affordable sustainment of existing weapon systems and to enhance mission readiness. Reduce repair and maintenance cycle time for aging systems and establish remanufacturing capabilities which will rapidly generate standardized replacement parts on demand. <ul style="list-style-type: none"> - (U) Complete effort to establish and demonstrate the capability to capture electronic device test requirements independent of specific test equipment, thereby, reducing the warfighter's systems life cycle burden. - (U) Initiate efforts to establish process improvements for repair/manufacture of large area structures on aging aircraft. - (U) Initiate efforts to mitigate the risk associated with electronic parts obsolescence. - (U) Initiate effort to establish a laser shock peening process in order to reduce high cycle fatigue failures in engine turbine blades. - (U) Initiate effort to respond rapidly to issues required by the aging aircraft fleet. - (U) \$2,295 Establish and demonstrate efficient and cost-effective manufacturing methods for high performance, high reliability electronics, lightweight structures, and efficient propulsion methods for advanced tactical missiles. Establish manufacturing improvements required to transition precision guided munitions' subsystems into production. Conduct pilot efforts in high-payoff endeavors aimed at validating potential benefits accrued from inserting best practices in the production of weapon systems. <ul style="list-style-type: none"> - (U) Complete Lean Implementation effort to establish and demonstrate the ability to produce military electronic modules on a commercial line. - (U) Continue the effort to establish an affordable manufacturing process for Light Detection and Ranging (LIDAR) wind sensors for munitions targeting, wind shear detection, and air data gathering. 		
Project 2865	Page 3 of 9 Pages	Exhibit R-2 (PE 0708011F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708011F Industrial Preparedness	PROJECT 2865
<ul style="list-style-type: none"> - (U) \$2,060 Establish and demonstrate affordable, flexible manufacturing processes to reduce the cost and lead time of higher performance spacecraft and launch vehicles. Establish effective and efficient manufacturing technology for critical high quality, reliable electronic component and assemblies required for surveillance, tracking communication links, and data/signal processing. Conduct pilot efforts in high-payoff endeavors aimed at providing efficient, low-cost capability to produce components and weapon systems in the space, launch, and Command, Control, Communications, and Intelligence (C3I) industrial base sectors. <ul style="list-style-type: none"> - (U) Complete efforts for finding efficient and affordable methods to produce rugate coatings. - (U) Continue efforts to establish manufacturing processes for affordable power efficient, space-qualified multi-bandgap solar cells. - (U) Continue Lean Space Initiative to infuse lean principles, concepts, and practices into the defense space industry. - (U) \$45,020 Total <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$24,610 Establish and demonstrate cost-effective and efficient manufacturing technologies for critical, high quality, reliable structural, propulsion, and electronic components and assemblies required for existing and next generation aircraft. Conduct pilot efforts in high-payoff endeavors aimed at validating potential benefits accrued from flexible manufacturing, commercial military integration, quality processing and supplier improvements. Conduct long-term projects focused on integrated product process development (IPPD) tools. <ul style="list-style-type: none"> - (U) Complete Phase II efforts on the Lean Aircraft Initiative to benchmark lean production concepts for the military aircraft industry. - (U) Complete the MEREOS project for a next generation data base management system for the reconciliation of Bill of Materials. - (U) Continue efforts to validate revolutionary approaches for manufacture of "all composite" air vehicles at costs of 50% of alternative structures. - (U) Continue effort to realize Rapid Response Improvement Process enhancements. - (U) Initiate efforts to establish an affordable Passive Infrared (IR) Coatings application process. - (U) Initiate effort focused on crucial lead time reduction and affordability enhancement of engine forgings. - (U) Initiate initiative addressing enhancement of small/medium supplier base providing components for weapon systems in acquisition stage of life cycle. - (U) \$18,010 Establish and demonstrate cost-effective repair and manufacturing technologies for affordable sustainment of existing weapon systems and to enhance mission readiness. Reduce repair and maintenance cycle time for aging systems and establish remanufacturing capabilities able to rapidly generate standardized replacement parts on demand. <ul style="list-style-type: none"> - (U) Complete Initial Lean Sustainment effort to identify approaches to transform depot maintenance support infrastructure into a world class enterprise. - (U) Continue efforts to establish large area structural repair capability for aging aircraft. - (U) Continue efforts to mitigate risk associated with the issue of electronics parts obsolescence. - (U) Continue effort on Lean Implementation of turbine engine blade tip repair to cut repair costs and reduce scrap by 30%. - (U) Continue to productionize the laser shock peening process. - (U) Initiate new sustainment initiatives focused on lean implementation, aging system requirements, and life cycle cost (LCC) reduction. 		
Project 2865	Page 4 of 9 Pages	Exhibit R-2 (PE 0708011F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0708011F Industrial Preparedness	2865
<ul style="list-style-type: none"> - (U) \$1,020 - (U) \$7,357 - (U) \$50,997 	<ul style="list-style-type: none"> Establish and demonstrate efficient and cost-effective manufacturing methods for high performance, highly reliable electronics, lightweight structures, and efficient propulsion methods for advanced tactical missiles. Establish manufacturing improvements required to transition precision guided munitions' subsystems into production. Conduct pilot efforts in high-payoff endeavors aimed at validating potential benefits accrued from inserting best practices in production of weapon systems. <ul style="list-style-type: none"> - (U) Continue Light Detection and Ranging (LIDAR) efforts to establish an affordably manufactured LIDAR wind sensor for munitions targeting, wind shear detection, and air data gathering. Establish and demonstrate affordable, flexible manufacturing processes to reduce the cost and lead time of higher performance spacecraft and launch vehicles. Establish effective and efficient manufacturing technology for critical high quality, reliable electronic component and assemblies required for surveillance, tracking communication links, and data/signal processing. Conduct pilot efforts in high-payoff endeavors aimed at providing efficient, low-cost capability to produce components and weapon systems in the space, launch, and Command, Control, Communications, and Intelligence (C3I) industrial base sectors. <ul style="list-style-type: none"> - (U) Complete effort to establish manufacturing processes for affordable power efficient, multi-bandgap solar cells. - (U) Continue effort to infuse lean production principles into defense space, aircraft, and launch vehicle industries. - (U) Initiate effort to rapidly respond to manufacturing issues in the industrial base. - (U) Initiate implementation of lean concepts in space sector industrial base. - (U) Initiate activities focused on providing affordable manufacturing processes for spacecraft electronic components and launch vehicle propulsion components. Total 	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)			DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708011F Industrial Preparedness			PROJECT 2865
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	50,632	48,429	45,923	Continuing
(U) Appropriated Value	52,969	48,429		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-1,194	-2,396		
b. SBIR	-1,143	-1,013		
c. Omnibus/Other Above Threshold Reprogrammings	-1,933			
d. Below Threshold Reprogrammings				
e. Rescissions	-84			
(U) Adjustments to Budget Years Since FY 1998 PB			5,074	
(U) Current Budget Submit/FY 1999 President's Budget	48,615	45,020	50,997	Continuing
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to Air Force priorities and budget constraints.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
<div style="display: flex; justify-content: space-between;"> Project 2865 Page 6 of 9 Pages Exhibit R-2 (PE 0708011F) </div>				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708011F Industrial Preparedness	PROJECT 2865
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(U) A. <u>Project Cost Breakdown (\$ in Thousands):</u>			
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) Manufacturing technologies for aircraft components	35,065	34,120	24,610
(U) Repair/remanufacture technologies for weapon systems sustainment	7,280	6,545	18,010
(U) Manufacturing methods for missile and munition assemblies	3,405	2,295	1,020
(U) Manufacturing processes to reduce spacecraft and launch vehicle costs	2,865	2,060	7,357
(U) Total	48,615	45,020	50,997

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708011F Industrial Preparedness	PROJECT 2865
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(U) B. Budget Acquisition History and Planning Information (\$ in Thousands):

Performing Organizations

Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	FY 1997	FY 1998	FY 1999	To Complete	Total Program
Product Development Organizations										
Numerous	Various	Various	N/A	N/A	N/A	24,945	21,182	35,262	Cont	Cont
TRW	CPFF	May 94			13,200	4,200	3,600	0	0	21,000
Howmet	Cost Share	Jul 95			2,500	2,000	5,000	4,000	8,750	22,250
Ontek	CPFF	Jan 95			3,000	1,600	1,400	1,000	0	7,000
Spectrolab	CPFF	Sep 95			250	900	1,250	660	0	3,060
General Atomics	CPFF	Aug 93			2,900	0	1,230	1,250	425	5,805
IBM	CPFF	Sep 93			2,800	1,300	170	0	0	4,270
Lockheed	Cost Share	Jun 96			500	1,188	761	0	0	2,449
McDnld Douglas	CPFF	May 94			28,100	9,800	1,811	0	0	39,711
TRW	CPFF	Sep 93			400	1,532	1,191	0	0	3,123
Boeing	CA	Dec 97			0	150	400	925	1125	2600
CAI(Consortium)	CPFF	Aug 97			0	1,000	6,500	4,500	13,500	25,500
Elec Parts Obsol	TBD	TBD			0	0	525	3,400	10,325	14,250

Support and Management Organizations - In-House Support.
 Test and Evaluation Organizations - Not Applicable.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)					DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development		PE NUMBER AND TITLE 0708011F Industrial Preparedness			PROJECT 2865	
<u>Government Furnished Property</u> - Not Applicable.						
Subtotal Product Development	N/A	48,615	45,020	50,997	Cont	Cont
Subtotal Support and Management	0	0	0	0	0	0
Subtotal Test and Evaluation	0	0	0	0	0	0
Total Project	N/A	48,615	45,020	50,997	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708026F Product/Reliable/Avail/Maintain Prog
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	15,856	21,764	970	9,753	20,891	30,685	30,948	Continuing	Continuing
2146 PRAM	15,856	12,306	970	9,753	20,891	30,685	30,948	Continuing	Continuing
4761 Aging Aircraft	0	9,458	0	0	0	0	0	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) **A. Mission Description and Budget Item Justification:** This Operational Systems Development program addresses acute reliability and maintainability (R&M) deficiencies by funding prototypes of developing and mature, commercial-off-the-shelf technologies that can be incorporated into existing Air Force weapon systems and subsystems. The objective of this program is to emphasize the rapid incorporation of R&M technology "fixes" that will improve the operational capability of weapon systems and equipment at a significantly lower cost. PRAM, a level-of-funding program, depends on MAJCOM, Air Logistics Center (ALC), and field support to implement the technology once the initial investment is completed. This program is in Budget Activity 7, Operational Systems Development, because projects are being engineered for already operational weapon systems. Note: Congress added \$22 million to this program in FY 1998: \$10 million for aging aircraft; \$8 million for blade repair facility efforts; and \$4 million for aging landing gear efforts.

(U) **Acquisition Strategy:** All projects within this Program Element were awarded competitively, either by full and open competition or by amending task order contracts with competition for subcontracts.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708026F Product/Reliable/Avail/Maintain Prog
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(U) B. Program Change Summary (\$ in Thousands):

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget (FY 1998 PB)	15,842	1,032	990	Cont
(U) Appropriated Value	16,564	23,032		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-346	-772		
b. SBIR	-376	-496		
c. Omnibus/Other Above Threshold Reprogrammings				
d. Below Threshold Reprogrammings	40			
e. Rescissions	-26			
(U) Adjustments to Budget Years Since FY 1998 PB			-20	
(U) Current Budget Submit/FY 1999 PB	15,856	21,764	970	Cont

(U) Change Summary Explanation:

Funding: Changes to this PE since the previous President's Budget are due to Air Force priorities and budget constraints. Below Threshold Reprogramming for new H-1 heaters.

Schedule: Not Applicable.

Technical: Not Applicable.

(U) C. **Other Program Funding Summary:** Not Applicable.

(U) D. **Schedule Profile:** Not Applicable.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708026F Product/Reliable/Avail/Maintain Prog	PROJECT 2146
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
2146 PRAM	15,856	12,306	970	9,753	20,891	30,685	30,948	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) **A. Mission Description and Budget Item Justification:** PRAM addresses acute reliability and maintainability (R&M) deficiencies by funding prototypes of developing and mature, commercial-off-the-shelf technologies that can be incorporated into existing Air Force weapon systems and subsystems. The objective of this program is to emphasize the rapid incorporation of R&M technology "fixes" that will improve the operational capability of weapon systems and equipment at a significantly lower cost. Average project length is twenty-seven months. This program has a proven return on investment averaging 18:1. PRAM, a level-of-funding program, depends on MAJCOM and field support to implement the technology when the initial investment is completed.

(U) **FY 1997 (\$ in Thousands):**

- (U) \$3,827 Completed efforts on Electro-Optical Viewing System (EVS) Data Presentation Group, Reusable Software for Spacecraft, Combination Generator Air Conditioner, Solid State High Band Generator, Fiber Optic Rate Gyro, Recore of Primary/Secondary Heat Exchanger, Expendable Countermeasures (EXCM) Bay Gasket, Hand-Held Directional Reflectometer, USM-464 Display and Software Media, and Module Bus Standardization Initiative.
- (U) \$2,707 Commenced blade tip project to model the repair facility at Oklahoma City Air Logistics Center. The study identified several potential improvements that would improve material flow and efficiency.
- (U) \$2,555 Continued work on aircraft subsystem R&M projects, including redesigning the inflatable overwing fairing seals and pivot bearing for the B-1. Completed efforts on a bird proof canopy and an advanced hybrid oxygen system (AHOS).
- (U) \$2,237 Continued work on aerospace support equipment R&M projects, including composite mobile maintenance stands and the System 2000 Maintainer project. Completed the H-1 heater replacement.
- (U) \$1,646 Supported aging aircraft initiatives in corrosion, composites, and repair.
 - (U) Provided quantitative tools needed to make intelligent, reliable forecasts of potential corrosion damage and to permit proactive engineering and maintenance to ensure the continued safe operation of aging aircraft weapon systems.
 - (U) Improved the data collection of optical detection of hidden corrosion inspection records and the system ability to catalog them for analysis.
 - (U) Accomplished enhancements and modifications necessary to the eddy current inspection system, using prototyped hardware as a baseline; end result is a nondestructive inspection system dedicated to lap joint corrosion inspections.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE PROJECT	
7 - Operational System Development	0708026F Product/Reliable/Avail/Maintain Prog 2146	
<ul style="list-style-type: none"> - (U) \$1,638 Completed ALR-20 panoramic indicator project and continued initial work on focal planar optics display. - (U) \$700 Continued airframe R&M durability patch project aimed at developing a field repair patch for vibro-acoustic cracks in sheet metal and support structures. - (U) \$465 Completed several short-term projects identified through Air Force Materiel Command's Technology Master Plan (TMP). TMP projects are prioritized based on operational capability, reliability and maintainability improvement, and cost. - (U) \$81 Continued ongoing nickel-hydrogen battery and multi-spectral satellite identification space systems efforts. - (U) \$15,856 Total 		
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$7,196 Begin improvement projects at Oklahoma City Air Logistics Center blade repair facility aimed at improving process flow and increasing shop efficiency. - (U) \$265 Complete B-1 projects focusing on subsystem R&M, significantly increasing overwing fairing seal and pivot bearing service lives. - (U) \$1,480 Continue work on aerospace support equipment R&M projects. Complete Advanced Technology Demonstration for next generation munition handler and complete composite mobile maintenance stands project. Begin E-3 rotodome test set effort. - (U) \$790 Continue work on aircraft avionics R&M projects. Complete the initial phase of the focal planar optics display and the C-141 electric starlifter project. - (U) \$1,137 Continue work on airframe R&M projects, including development of a durability patch for low-cost, reliable installation in the field. - (U) \$473 Complete projects identified through Air Force Materiel Command's TMP. TMP projects are prioritized based on operational capability, reliability and maintainability improvement, and cost. - (U) \$95 Complete space system efforts for nickel hydrogen battery and satellite identification. - (U) \$500 Initiate base infrastructure R&M projects. Begin seismic range scoring system effort. - (U) \$370 Start and complete high priority quick response projects identified by operational commands outside the normal annual planning process. - (U) \$12,306 Total 		
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$470 Continue airframe R&M projects. Begin C-130 corrosion-resistant longerons and measurement of paint thickness on fiberglass radomes efforts. - (U) \$320 Completed several short-term projects identified through Air Force Materiel Command's TMP. TMP projects are prioritized based on operational capability, reliability and maintainability improvement, and cost. - (U) \$180 Start and complete high priority, quick response R&M projects identified by operational commands. - (U) 970 Total 		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)				DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708026F Product/Reliable/Avail/Maintain Prog			PROJECT 2146
(U) B. <u>Program Change Summary (\$ in Thousands):</u>				
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total</u> <u>Cost</u>
(U) Previous President's Budget (FY 1998 PB)	15,842	1,032	990	Cont
(U) Current Budget Submit/FY 1999 PB	15,856	12,306	970	Cont
(U) Change Summary Explanation:				
Funding: Changes to this PE since the previous President's Budget are due to Air Force priorities and budget constraints.				
Schedule: Not Applicable.				
Technical: Not Applicable.				
(U) C. <u>Other Program Funding Summary:</u> Not Applicable.				
(U) D. <u>Schedule Profile:</u> Not Applicable.				
Project 2146	Page 5 of 11 Pages			Exhibit R-2 (PE 0708026F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0708026F Product/Reliable/Avail/Maintain Prog			PROJECT 2146		
(U) A. <u>Project Cost Breakdown (\$ in Thousands):</u>										
					<u>FY 1997</u>	<u>FY 1998</u>		<u>FY 1999</u>		
(U)	EVS Data Presentation Group				3,827	0				
(U)	Blade Tip Repair Project				2,707	7,196				
(U)	Aircraft Subsystem R&M				2,555	265				
(U)	Aerospace Support Equipment R&M				2,237	1,480				
(U)	Aging Aircraft				1,646	0				
(U)	Aircraft Avionics R&M				1,638	790				
(U)	Airframe R&M				700	1,137		470		
(U)	TMP Projects				465	473		320		
(U)	Space Systems R&M				81	95				
(U)	Base Infrastructure R&M				0	500				
(U)	Quick Response				0	370		180		
(U)	Total				15,856	12,306		970		
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands):</u>										
<u>Performing Organizations:</u>										
Contractor or	Contract									
Government	Method/Type	Award or	Performing	Project	Total				To	Total
Performing	or Funding	Obligation	Activity	Office	Prior to				Complete	Program
<u>Activity</u>	<u>Vehicle</u>	<u>Date</u>	<u>EAC</u>	<u>EAC</u>	<u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>		
Product Development Organizations										
Numerous	Various	Various	N/A	N/A	N/A	14,040	11,052	690	Cont	Cont
Government	Various	Various	N/A	N/A	N/A	1,816	1,254	280	Cont	Cont
Support and Management Organizations - In-House Support.										
Project 2146					Page 6 of 11 Pages			Exhibit R-3 (PE 0708026F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY					PE NUMBER AND TITLE					PROJECT
7 - Operational System Development					0708026F Product/Reliable/Avail/Maintain Prog					2146
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	To <u>Complete</u>	Total <u>Program</u>
Test and Evaluation Organizations - Not Applicable.										
Government Furnished Property: Not Applicable.										
Product Development Property - Not Applicable.										
Support and Management Property - Not Applicable.										
Test and Evaluation Property - Not Applicable.										
Subtotal Product Development					15,856	12,306	970	Cont	Cont	
Subtotal Support and Management					0	0	0	0	0	
Subtotal Test and Evaluation					0	0	0	0	0	
Total Project					15,856	12,306	970	Cont	Cont	

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708026F Product/Reliable/Avail/Maintain Prog	PROJECT 4761
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4761 Aging Aircraft	0	9,458	0	0	0	0	0	Continuing	Continuing

Quantity of RDT&E Articles									
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(U) **A. Mission Description and Budget Item Justification:** This program is comprised of multiple efforts which will transition needed technologies from laboratory research and commercial technology development into fieldable tools or capabilities. Projects will target critical needs of the aging fleet such as corrosion, structural integrity, and improved non-destructive inspection (NDI) methods. Corrosion-related projects include hidden corrosion detection (NDI methods such as eddy current and thermography) and developing a corrosion prediction capability. Structural integrity projects will include the development of alternate repair capabilities and capability to predict widespread fatigue damage. In addition to the NDI projects addressing corrosion detection, other NDI projects will address multi-layer crack detection and detection of cracks under composite patches. These projects are focused on developing tools (NDI equipment, computer models) and capabilities (alternate repair processes) for Air Logistics Centers (ALCs) use in extending useful aircraft service life, resolving flight safety problems, or replacing components no longer procurable. Projects will typically yield a single, validated prototype system or capability that is production ready; final depot or field implementation (equipment purchases, tech order updates, training, etc.) will be the responsibility of the Major Commands (MAJCOMs) and ALCs. There is strong emphasis on developing solutions that will benefit multiple weapon systems, thereby, reducing or eliminating stovepipe development of platform-specific solutions. Note: Aging aircraft efforts for FY 1999 and out are addressed in PE 0605011F, RDT&E for Aging Aircraft.

(U) FY 1997: Not Applicable.

(U) FY 1998 (\$ in Thousands):

- (U) \$6,000 Support Aging Aircraft initiatives in NDI, structural integrity, and corrosion.
 - (U) Further expand the capability of the ultrasonic scan to detect fatigue cracks in second layer structure. This effort will evaluate potential applications for C-141, C-130, and F-15 inspections.
 - (U) Improve the throughput for scanning and erasing the reusable phosphor screen for filmless radiography, which should reduce the touch labor required for manual processing.
 - (U) Expand the use of composite patch repairs beyond wing structures to include thin-skin fuselage structures.
 - (U) Develop corrosion growth rate model, evaluate corrosion monitoring devices, evaluate material substitution as a repair option, and evaluate commercial maintenance practices to determine applicability to military aircraft.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																																			
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708026F Product/Reliable/Avail/Maintain Prog	PROJECT 4761																																																																			
<p>– (U) \$3,458 Develop engineering logistics analysis tools to help predict future failure rates, maintain flight safety, and extend the life of aircraft landing gear.</p> <p>– (U) \$9,458 Total</p> <p>(U) <u>FY 1999</u>: Not Applicable.</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands):</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 PB</td> <td style="text-align: center;">0</td> <td style="text-align: center;">9,458</td> <td style="text-align: center;">0</td> <td></td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: Congress added \$10 million to this Program in FY 1998 for aging aircraft.</p> <p>Schedule: Not Applicable.</p> <p>Technical: Not Applicable.</p> <p>(U) C. <u>Other Program Funding:</u> Not Applicable.</p> <p>(U) D. <u>Schedule Profile:</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th colspan="4" style="text-align: center;"><u>FY 1997</u></th> <th colspan="4" style="text-align: center;"><u>FY 1998</u></th> <th colspan="4" style="text-align: center;"><u>FY 1999</u></th> </tr> <tr> <td></td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> <td style="text-align: center;">3</td> <td style="text-align: center;">4</td> </tr> </thead> <tbody> <tr> <td>(U) RFP Release</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Contract Awards</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: center;">X</td> <td style="text-align: center;">X</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	0	0	0		(U) Current Budget Submit/FY 1999 PB	0	9,458	0			<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>					1	2	3	4	1	2	3	4	1	2	3	4	(U) RFP Release						X							(U) Contract Awards						X	X					
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																																	
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Project 4761	Page 9 of 11 Pages	Exhibit R-2 (PE 0708026F)																																																																			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0708026F Product/Reliable/Avail/Maintain Prog			PROJECT 4761		
(U) A. <u>Project Cost Breakdown (\$ in Thousands):</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Aging Aircraft Initiatives				0	6,000	0			
(U)	Aging Landing Gear				0	3,458	0			
(U)	Total				0	9,458	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands):</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
SAIC	Mod	TBD			0	0	1,900	0	0	1,900
SW Research	Mod	TBD			0	0	1,500	0	0	1,500
NCI	TBD	TBD			0	0	1,990	0	0	1,990
Liberty Tech	CPFF	TBD			0	0	475	0	0	475
General Atomics	TBD	TBD			0	0	3,458	0	0	3,458
TBD	TBD	TBD			0	0	135	0	0	135
Support and Management Organizations - Not Applicable.										
Test and Evaluation Organizations - Not Applicable.										
<u>Government Furnished Property:</u> Not Applicable.										
Project 4761					Page 10 of 11 Pages			Exhibit R-3 (PE 0708026F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0708026F Product/Reliable/Avail/Maintain Prog			PROJECT 4761		
<u>Description</u>	<u>Contract Method/Type or Funding Vehicle</u>	<u>Award or Obligation Date</u>	<u>Delivery Date</u>	<u>Total Prior to FY 1997</u>	<u>Budget FY 1997</u>	<u>Budget FY 1998</u>	<u>Budget FY 1999</u>	<u>Budget to Complete</u>	<u>Total Program</u>
<u>Product Development Property - None</u>									
<u>Support and Management Property - None</u>									
<u>Test and Evaluation Property - None</u>									
Subtotal Product Development				0	0	9,458	0	Cont	Cont
Subtotal Support and Management				0	0	0	0	0	0
Subtotal Test and Evaluation				0	0	0	0	0	0
Total Project				0	0	9,458	0	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708071F Joint Logistics Program - Ammunition System	PROJECT 4679
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4679 Ammunition Management Standard System (AMSS)	13,780	0*	16,086	13,474	11,554	11,672	11,814	14,748	101,470
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

All funds in FY 97 and FY 99 through 03 were converted from Operations & Maintenance (O&M) to RDT&E to align with the actual use of the funds for development activity.

* \$8,342 of FY 98 funds were reclassified to RDT&E from the O&M Appropriation.

(U) A. Mission Description and Budget Item Justification

Air Force is the Executive Agent for AMSS. AMSS is the joint migration system being developed to improve and integrate ammunition management business functions and data across the DoD. It directly supports the goals of the DoD Logistics Strategic Plan (1996 edition) to: reduce logistics response times, provide total asset visibility, develop seamless logistics systems, and streamline the logistics infrastructure. When fully operational, AMSS will provide integrated, flexible, and timely ammunition management information necessary for the planning, provisioning, and sustainment of military operations world-wide. The first release of the system will contain sufficient functionality to all Services to allow the current legacy systems to either be turned off completely or used minimally. The functionality to be included in the first release of AMSS has been identified by the Services' Configuration Management Team. Additional required functionality will be added in future releases based upon Service priority and available funding. When completely developed, integrated and implemented AMSS will support the functionality for all ammunition management at the Inventory Control Point (ICP) and command levels. This program is in Budget Activity 7 - Operational System Development because it modernizes automated information systems.

(U) Acquisition Strategy: All Contracts within this Program Element were awarded after full and open competition.

(U) FY 1997 (\$ in Thousands):

- (U) \$8,370 Software Development
- (U) \$3,703 Support Contractors, Mission support, etc.
- (U) \$1,707 Government Furnished Equipment (GFE)/Commercial Off The Shelf (COTS)
- (U) \$13,780 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)		DATE February 1998																																																		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708071F Joint Logistics Program - Ammunition System	PROJECT 4679																																																		
<p>(U) <u>FY 1998* (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$3,479 Software Development – (U) \$3,829 Support Contractors, Mission support, etc – (U) \$830 GFE/COTS – (U) \$204 GFE and COTS software update, debug, maintenance. – (U) \$8,342 Total <p>* FY 98 funds were reclassified to RDT&E from the O&M Appropriation.</p> <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> – (U) \$ 11,120 Software Development – (U) \$ 4,245 Support Contractors, Mission support, etc – (U) \$ 721 GFE and COTS software update, debug, maintenance. – (U) \$ 16,086 Total <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; width: 10%;"><u>FY 1997</u></th> <th style="text-align: center; width: 10%;"><u>FY 1998*</u></th> <th style="text-align: center; width: 10%;"><u>FY 1999</u></th> <th style="text-align: center; width: 10%;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget</td> <td></td> <td></td> <td style="text-align: center;">0</td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Appropriated Value</td> <td></td> <td></td> <td></td> <td style="text-align: center;">TBD</td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Reductions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td style="text-align: center;">13,780</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">16,086</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 99 Presidents Budget</td> <td style="text-align: center;">13,780</td> <td style="text-align: center;">0*</td> <td style="text-align: center;">16,086</td> <td style="text-align: center;">TBD</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation: Funding: FY 97 1415-3 reprogramming action converted funds from O&M to RDT&E. All funds in FY 99 through 03 were converted from O&M to RDT&E to align with the actual use of the funds for development activity. * \$8,342 of FY 98 funds were reclassified to RDT&E from the O&M Appropriation. Schedule: No change.</p>				<u>FY 1997</u>	<u>FY 1998*</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget			0	TBD	(U) Appropriated Value				TBD	(U) Adjustments to Appropriated Value					a. Cong Reductions					b. SBIR					c. Omnibus or Other Above Threshold Reprogram	13,780				d. Below Threshold Reprogramming					(U) Adjustments to Budget Years Since FY 1998 PB			16,086		(U) Current Budget Submit/FY 99 Presidents Budget	13,780	0*	16,086	TBD
	<u>FY 1997</u>	<u>FY 1998*</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																
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Project 4679	Page 2 of 5 Pages	Exhibit R-2 (PE 0708071F)																																																		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																																										
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708071F Joint Logistics Program - Ammunition System	PROJECT 4679																																																																										
<p>Technical: No change.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> N/A</p> <p>(U) D. <u>Schedule Profile</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;"></th> <th colspan="4" style="text-align: center;"><u>FY 1997</u></th> <th colspan="4" style="text-align: center;"><u>FY 1998</u></th> <th colspan="4" style="text-align: center;"><u>FY 1999</u></th> </tr> <tr> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> <th style="text-align: center;">1</th> <th style="text-align: center;">2</th> <th style="text-align: center;">3</th> <th style="text-align: center;">4</th> </tr> </thead> <tbody> <tr> <td colspan="12">(U) Phase One</td> </tr> <tr> <td colspan="3">Development Contract Award</td> <td style="text-align: center;">X</td> <td colspan="8"></td> </tr> <tr> <td colspan="3">Critical Design Review</td> <td colspan="4"></td> <td style="text-align: center;">X</td> <td colspan="5"></td> </tr> <tr> <td colspan="3">Full Scale Development Complete</td> <td colspan="8"></td> <td style="text-align: center;">X</td> </tr> </tbody> </table>				<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>				1	2	3	4	1	2	3	4	1	2	3	4	(U) Phase One												Development Contract Award			X									Critical Design Review							X						Full Scale Development Complete											X
	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>																																																																			
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Project 4679	Page 3 of 5 Pages	Exhibit R-2 (PE 0708071F)																																																																										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0708071F Joint Logistics Program - Ammunition System				PROJECT 4679	
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998*</u>	<u>FY 1999</u>			
(U)	Software Development EDS				8,370	3,479	11,120			
(U)	Other Govt Costs				3,703	3,829	4,245			
(U)	Government Furnished Equipment (GFE)/COTS				1,707	830	0			
(U)	GFE and COTS software update, debug, maintenance				0	204	721			
(U)	Total				13,780	8,342	16,086			
* FY 98 funds were reclassified to RDT&E from the O&M Appropriation.										
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organization</u>										
EDS	Cost + Award Fee	7 Jul 97	\$24,254	\$27,662*	-0-	\$8,370*	\$3,479*	\$11,120*	\$4,693*	\$27,662*
Unknown	TBD	TBD		24,070*	-0-	-0-	-0-	-0-	24,070*	24,070*
*Includes 2% DISA fee										
<u>Support and Management Organizations:</u>										
Innolog, KPMG, MITRE, MCR			12,874	12,874	-0-	2,500	1,790	1,438	7146	12,874
SPO WPAFB			12,777	12,777	-0-	1,103	1,939	2,407	7,602	13,051
GFE and COTS software update, debug, maintenance.	TBD	TBD	9,418	9,418	-0-		204	721	8,493	9,418
Project 4679										
Page 4 of 5 Pages										
Exhibit R-3 (PE 0708071F)										

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)									DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0708071F Joint Logistics Program - Ammunition System				PROJECT 4679	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Test and Evaluation Organizations:</u>										
Army OPTEC			1,000	1,000	-0-	-0-	-0-	200	-800-	1000
IV&V			1,380	1,380	-0-	100	100	200	-980-	1,380
(U) B. Budget Acquisition History and Planning Information (Continued) (\$ in Thousands)										
Government Furnished Property:										
Item Description	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Delivery Date		Total Prior to FY 1997	Budget FY 1997	Budget FY 1998*	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Property</u>										
COTS S/W and H/W		GSA Sc.	As Req'd	As Req'd	-0-	1,707	830	-0-	-0-	2,537
<u>Support and Management Property</u>										
COTS S/W		GSA Sch.	As Req'd	As Req'd	-0-	-0-	-0-	-0-	3,229	3,229
Hardware		GSA Sch.	As Req'd	As Req'd	-0-	-0-	-0-	-0-	6,249	6,249
<u>Test and Evaluation Property:</u> Shared with development resources										
Subtotal Product Development					-0-	10,077	4,309	11,120	28,763	54,269
Subtotal Support and Management					-0-	3,603	3933	4566	32,719	44,821
Subtotal Test and Evaluation					-0-	100	100	400	1,780	2,380
Total Project					-0-	13,780	8,342	16,086	63262	101,470
* Funds have been reclassified to RDT&E from O&M Appropriation.										
Project 4679					Page 5 of 5 Pages			Exhibit R-3 (PE 0708071F)		

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
Total Program Element (PE) Cost	25,329	3,404	23,010	23,840	31,506	32,057	31,087	Continuing	Continuing
3090 Embedded Computer Resources Support Improvement Program (ESIP)	2,913	2,052	2,344	2,428	2,419	3,461	3,523	Continuing	Continuing
3318 Product Data Systems Modernization (PDSM)	1,933	1,352	1,349	1,391	3,809	2,464	2,509	Continuing	Continuing
3759 Air Force Support Equipment Management (AFSEM)**	3,261	0	0	0	0	0	0	0	TBD
4654 Integrated Maintenance Data System (IMDS)*	17,222	0*	19,317	20,021	25,278	26,132	25,055	Continuing	Continuing
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

* IMDS FY 98 funds (\$18.541 million) reside within PE 0603108F. Beyond FY 98, all IMDS funds reside within PE 0708611F, project 4654.

** AFSEM program terminated at end of FY 97.

(U) A. Mission Description and Budget Item Justification

This program will develop and field an AF standard maintenance information system to integrate information systems supporting Air Force maintenance activities into a single open architecture, modern decision support system. This enhanced decision support system will increase operational production capability and support system efficiency, while decreasing mobility infrastructure requirements and cost of operations. Other projects improve support of embedded computer system software, automate and standardize weapon system support processes, establish advanced support methodologies, provide automated tools and infrastructure environments, and improve readiness support to facilitate rapid software turnaround in response to changing mission and/or threat requirements. Efforts perform research and development to update Air Force digital data standards to commercial industry standards that support the Continuous Acquisition and Life-Cycle Support (CALS) concept. This program funds the Air Force support equipment (SE) management objective to develop, support, distribute, and maintain products that improve Air Force SE acquisition. It supports the Air Force Automatic Test Systems (ATS) Product Master Plan and Air Force ATS Database to identify and evaluate all Air Force ATS for both long and short-term planning. This program is in budget activity 7 - Operational System Development, because projects are being engineered to support already operational weapon systems.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)
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(U) **B. Program Change Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget FY 1998 PB	8,107	3,657	3,767	Continuing
(U) Appropriated Value	8,405	3,657		
(U) Adjustments to Appropriated Value				
a. Congressional/General Reductions	-178	-168		
b. SBIR	-120	-85		
c. Omnibus or Other Above Threshold Reprogramming	17,332			
d. Below Threshold Reprogramming	-44			
e. Rescissions	-66			
(U) Adjustments to Budget Years Since FY 1998 PB			19,243	
(U) Current Budget Submit/FY 1999 President's Budget	25,329	3,404	23,010	Continuing

(U) Change Summary Explanation:

Funding: Funding for IMDS for FY 97 and FY 99 and outyears transferred from PE 0603108F. FY 98 funds (\$19.753 million) still remain in PE 0603108F because FY 97 reclassification was approved after the FY 98 President's Budget was finalized.

Schedule: Not applicable.

Technical: Not applicable.

(U) **C. Other Program Funding Summary (\$ in Thousands)**

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Other Procurement - AF, BA 7, P-1:55, PE 0708611F (Project 3090 ESIP)	1,645	1,997	2,632	2,284	2,322	2,378	2,434	Cont	Cont
(U) O&M- AF (Project 3090, ESIP)	11,622	12,096	10,543	10,989	14,127	14,391	14,668	Cont	Cont
(U) Other Procurement - AF BA 7, P-1:55, PE 0708611F (Project 4654 IMDS)	0	2,800	2,751	2,721	2,686	2,688	2,648	Cont	Cont
(U) O&M - AF (Project 4654 IMDS)	0	886	949	1,879	1,855	1,891	1,926	Cont	Cont

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)
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Related RDT&E:

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl Cont</u>	<u>Total Cost Cont</u>
(U) PE 0603108F, Integrated Data Systems (IDS)*	0	18,541	0	0	0	0	0		
* RDT&E funds located within PE 0603108F, Project 4427, Integrated Maintenance Data Systems (IMDS).									

(U) **D. Schedule Profile:**
See individual projects.

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)	PROJECT 3090
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3090 Embedded Computer Resources Support Improvement Program (ESIP)	2,913	2,052	2,344	2,428	2,419	3,461	3,523	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

This project conducts research to improve support of embedded computer system software. It encompasses automation and standardization of support processes, advanced support methodologies, tools and environments, and readiness support to facilitate rapid turnaround of software in response to changing mission and/or changing threat requirements. This project is in Budget Activity 7, Operational System Development, because efforts are being engineered to support already operational weapon systems.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997 (\$ in Thousands):

- (U) \$25 Demonstrate real-time fault-tolerant software demonstration.
- (U) \$1,008 Develop virtual simulator module switching unit.
- (U) \$600 RF testing techniques.
- (U) \$470 Enhanced Ada re-engineering demonstration.
- (U) \$470 JOVIAL prototype verification and validation system.
- (U) \$70 Demonstrated automated visualization capability.
- (U) \$270 Advanced Avionics Verification and Validation (AAV&V).
- (U) \$2,913 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$130 Advanced Avionics Verification and Validation (AAV&V).
- (U) \$165 Adaptive Software Technology Development (ASTD).
- (U) \$255 Automated Operational Flight Program (OFF) Validation (AutoVal).
- (U) \$255 Incremental Software Evolution for Real-Time (INSERT).
- (U) \$390 Legacy Software Re-Engineering Technology (LSRET).
- (U) \$130 Reconfigurable Avionics Computer Emulator (RACE).
- (U) \$130 System Avionics Laboratory Support (SALS).
- (U) \$597 Virtual Test Station (VTS).
- (U) \$2,052 Total

DATE
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BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0708611F Support Systems Development (SSD)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)	PROJECT 3090																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$350 Adaptive Software Technology Development (ASTD). - (U) \$320 Automated Operational Flight Program (OFP) Validation (AutoVal). - (U) \$255 Incremental Software Evolution for Real-Time (INSERT). - (U) \$307 Legacy Software Re-Engineering Technology (LSRET). - (U) \$130 Reconfigurable Avionics Computer Emulator (RACE). - (U) \$130 System Avionics Laboratory Support (SALS). - (U) \$597 Virtual Test Station (VTS). - (U) \$255 Future Embedded Computer Systems Support Technologies (FEST) - (U) \$2,344 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 10%; text-align: center;"><u>FY 1997</u></th> <th style="width: 10%; text-align: center;"><u>FY 1998</u></th> <th style="width: 10%; text-align: center;"><u>FY 1999</u></th> <th style="width: 10%; text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget FY 1998 PB</td> <td style="text-align: center;">2,913</td> <td style="text-align: center;">2,207</td> <td style="text-align: center;">2,391</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">2,975</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional/General Reductions</td> <td style="text-align: center;">-62</td> <td style="text-align: center;">-109</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td style="text-align: center;">-46</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-47</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">2,913</td> <td style="text-align: center;">2,052</td> <td style="text-align: center;">2,344</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: Not applicable Schedule: Not applicable. Technical: Not applicable.</p> <p>(U) <u>C. Other Program Funding Summary (\$ in Thousands):</u> See page 2, C., Other Program Funding Summary.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget FY 1998 PB	2,913	2,207	2,391	Continuing	(U) Appropriated Value	2,975				(U) Adjustments to Appropriated Value					a. Congressional/General Reductions	-62	-109			b. SBIR		-46			c. Omnibus or Other Above Threshold Reprogramming					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB			-47		(U) Current Budget Submit/FY 1999 President's Budget	2,913	2,052	2,344	Continuing
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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Project 3090	Page 5 of 23 Pages	Exhibit R-2 (PE 0708611F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)											DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)						PROJECT 3090	
(U) D. <u>Schedule Profile</u>												
		<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>		
	1	2	3	4	1	2	3	4	1	2	3	4
(U)	Demonstrate real-time fault tolerant software techniques.											
		X										
(U)	Develop virtual simulator module switching unit.											
	X											
(U)	RF testing techniques.											
				X								
(U)	Enhanced Ada re-engineering demonstration.											
				X								
(U)	Begin Advanced Avionics Verification and Validation (AAV&V).											
								X				
(U)	Complete Advanced Avionics Verification and Validation (AAV&V).											
								X				
(U)	JOVIAL prototype verification and validation system.											
	X											
(U)	Demonstrate automated visualization capability.											
		X										
(U)	Begin Automated OFP Validation (AutoVal)											
					X							
(U)	Complete Automated OFP Validation (AutoVal)											
									X			
(U)	Begin Incremental Software Evolution for Real-Time (INSERT).											
						X						
(U)	Complete Incremental Software Evolution for Real-Time (INSERT).											
										X		
(U)	Begin Legacy Software Re-Engineering Technology (LSRET).											
							X					
(U)	Complete Legacy Software Re-Engineering Technology (LSRET).											
											X	
(U)	Begin Virtual Test Station.											
							X					
(U)	Complete Virtual Test Station.											
											X	
(U)	Future Embedded Computer Systems Support Technologies (FEST)											
									X			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)			PROJECT 3090			
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>				
(U)	Demonstrate real-time fault tolerant software techniques.			25						
(U)	Develop virtual simulator module switching unit.			1,008						
(U)	RF testing techniques.			600						
(U)	Enhanced Ada re-engineering demonstration.			470						
(U)	JOVIAL prototype verification and validation system.			470						
(U)	Demonstrate automated visualization capability.			70						
(U)	Advanced Avionics Verification and Validation (AAV&V).			270	130					
(U)	Adaptive Software Technology Development (ASTD).				165	350				
(U)	Automated OFP Validation (AutoVal).				255	320				
(U)	Incremental Software Evolution for Real-Time (INSERT).				255	255				
(U)	Legacy Software Re-Engineering Technology (LSRET).				390	307				
(U)	Reconfigurable Avionics Computer Emulator (RACE).				130	130				
(U)	System Avionics Laboratory Support (SALS).				130	130				
(U)	Virtual Test Station (VTS).				597	597				
(U)	Future Embedded Computer Systems Support Technologies (FEST).					255				
(U)	Total			2,913	2,052	2,344				
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
SAIC	D.O.	Various	N/A	N/A	\$2,913	\$697	\$660	\$406	N/A	N/A
TASC	D.O.	Various	N/A	N/A	\$1,449	\$931	\$450	\$100	N/A	N/A
TRW	D.O.	Various	N/A	N/A	\$1,131	0	0	0	0	\$1,131
Various	Various	Various	N/A	N/A	516	\$348	\$587	\$549	N/A	N/A
Project 3090				Page 7 of 23 Pages			Exhibit R-3 (PE 0708611F)			

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)										DATE February 1998
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)					PROJECT 3090
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Support and Management Organizations</u>										
OO-ALC	N/A	N/A	N/A	N/A	0	\$937	\$355	\$1,289	N/A	N/A
<u>Test and Evaluation Organizations</u>										
Not applicable.										
Government Furnished Property:										
Not applicable.										
Subtotal Product Development					\$6,009	\$1,976	\$1,697	\$1,055	N/A	N/A
Subtotal Support and Management					0	\$937	\$355	\$1,289	N/A	N/A
Subtotal Test and Evaluation					0	0	0	0	N/A	N/A
Total Project					\$6,009	\$2,913	\$2,052	\$2,344	N/A	N/A

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)	PROJECT 3318
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3318 Product Data Systems Modernization (PDSM)	1,933	1,352	1,349	1,391	3,809	2,464	2,509	Continuing	Continuing

(U) A. Mission Description and Budget Item Justification

This project implements digital product data management within the Air Force Integrated Weapon System Management infrastructure and ensures uninterrupted transition of functional capabilities of legacy systems to the new joint systems. This project is in Budget Activity 7, Operational System Development, because activities support development and implementation of common information system programs.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997 (\$ in Thousands):

- (U) \$300 Manage AF technical data activities.
- (U) \$265 Plan/participate/activate JEDMICS sites.
- (U) \$206 Develop and maintain digital data templates for new acquisition technical orders.
- (U) \$420 Plan/participate in JCALS to ensure AF requirements and schedules are met.
- (U) \$474 Activate AF JCALS sites to ensure timely and accurate data is available and useable.
- (U) \$208 Test digital data specifications/standards and represent AF at international standards' activities.
- (U) \$60 Provide direct support to weapon systems, Logistics and Product Centers, and MAJCOMs.
- (U) \$1,933 Total

(U) FY 1998 (\$ in Thousands):

- (U) \$243 Manage AF technical data activities.
- (U) \$24 Plan/participate/activate/sustain JEDMICS.
- (U) \$188 Develop and maintain digital data templates for new acquisition technical orders.
- (U) \$253 Plan/participate in JCALS to ensure AF requirements are met.
- (U) \$394 Activate AF JCALS sites to ensure timely and accurate data is available and useable.
- (U) \$188 Test digital data specifications/standards and represent AF at international standards activities.
- (U) \$62 Provide direct support to weapon systems, Logistics and Product Centers, and MAJCOMs.
- (U) \$1,352 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)	PROJECT 3318																																																							
<p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) \$232 Manage AF technical data activities. - (U) \$12 Sustain JEDMICS. - (U) \$180 Develop and maintain digital data templates for new acquisition technical orders. - (U) \$243 Plan/participate in JCALS to ensure AF requirements are met. - (U) \$449 Activate AF JCALS sites to ensure timely and accurate data is available and useable. - (U) \$180 Test digital data specifications/standards and represent AF at international standards activities. - (U) \$53 Provide direct support to weapon systems, Logistics and Product Centers, and MAJCOMs. - (U) \$1,349 Total <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1997</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1998</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>FY 1999</u></th> <th style="text-align: center; border-bottom: 1px solid black;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget FY 1998 PB</td> <td style="text-align: center;">1,933</td> <td style="text-align: center;">1,450</td> <td style="text-align: center;">1,376</td> <td style="text-align: center;">Continuing</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">1,974</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Congressional/General Reductions</td> <td style="text-align: center;">-41</td> <td style="text-align: center;">-59</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td></td> <td style="text-align: center;">-39</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td style="text-align: center;">-27</td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">1,933</td> <td style="text-align: center;">1,352</td> <td style="text-align: center;">1,349</td> <td style="text-align: center;">Continuing</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: Not applicable</p> <p style="padding-left: 40px;">Schedule: Not applicable.</p> <p style="padding-left: 40px;">Technical: Not applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget FY 1998 PB	1,933	1,450	1,376	Continuing	(U) Appropriated Value	1,974				(U) Adjustments to Appropriated Value					a. Congressional/General Reductions	-41	-59			b. SBIR		-39			c. Omnibus or Other Above Threshold Reprogramming					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB			-27		(U) Current Budget Submit/FY 1999 President's Budget	1,933	1,352	1,349	Continuing
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
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(U) Current Budget Submit/FY 1999 President's Budget	1,933	1,352	1,349	Continuing																																																					
Project 3318	Page 10 of 23 Pages	Exhibit R-2 (PE 0708611F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0708611F Support Systems Development (SSD)	3318
<p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> Not applicable.</p> <p>(U) D. <u>Schedule Profile</u> Not applicable. This is a support and management level of effort program. All activities are ongoing.</p>		
Project 3318	Page 11 of 23 Pages	Exhibit R-2 (PE 0708611F)

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)			PROJECT 3318		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Manage AF technical data activities.				300	243	232			
(U)	Plan/participate/activate JEDMICS sites.				265	24	12			
(U)	Test digital data specifications/standards and represent AF at international standards activities.				208	188	180			
(U)	Develop and maintain digital data templates for new acquisition technical orders				206	188	180			
(U)	Plan/participate in JCALS to ensure AF requirements and schedules are met.				420	253	243			
(U)	Activate AF JCALS sites to ensure timely and accurate data is available and useable.				474	394	449			
(U)	Provide direct support to weapon systems, Logistics and Product Centers, and Major Commands (MAJCOMs).				60	62	53			
(U)	Total				1,933	1,352	1,349			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
Not applicable.										
<u>Support and Management Organizations</u>										
RJO	ECRC	Var	N/A	N/A	6,684	597	418	416	TBD	TBD
LOGTEC	GSA	Var	N/A	N/A	10,027	978	684	683	TBD	TBD
BTAS	8a	Var	N/A	N/A	0	358	250	250	TBD	TBD
Project 3318					Page 12 of 23 Pages			Exhibit R-3 (PE 0708611F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)				PROJECT 3318	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Test and Evaluation Organizations</u> Not applicable.										
Government Furnished Property: Not applicable.										
Subtotal Product Development					0	0	0	0	0	0
Subtotal Support and Management					16,711	1,933	1,352	1,349	TBD	TBD
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					16,711	1,933	1,352	1,349	TBD	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)	PROJECT 3759
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
3759 Air Force Support Equipment Management (AFSEM)**	3,261	0	0	0	0	0	0	0	TBD

** AFSEM program terminates at end of FY 97.

(U) A. Mission Description and Budget Item Justification

The Automatic Test Systems (ATS) Product Group Manager (PGM) Product Master Plan (PMP) and ATS Database development effort is designed to give the ATS Product Group Manager (PGM) the tools to track and plan Air Force ATS direction. The PMP will support standardization and ATS PGM long-term planning by capturing essential data on all Air Force ATS. The Database will include all ATS identified in the PMP and be used to interface with Integrated Weapon System Master Plans. The ATS Database will also include the ATS Tracking Requirements Database. It will provide ATS users and managers the capability to determine existing ATS inventory and ATS developments. The ATS Database will be made available remotely to ATS PGM customers via Ethernet Local Area Network and be accessible on the World Wide Web. The follow-on effort to use the developed ATS Product Master Plan and ATS Database tools require specialized studies focusing on targeted ATS product lines to achieve ATS standardization and common support equipment goals. The ATS Standardization effort will accomplish analyses, development and/or acquisition plans for standardized ATS and ATS software to satisfy replacement requirements for aging/unsupported Depot and intermediate avionics ATS, and include expansion capabilities for the addition of new weapon system requirements. Accomplishment of up-front ATS requirements analyses with a goal to provide improved logistics support for multiple weapon systems, while downsizing the Air Force ATS inventory, will ensure Air Force and DoD goals are met. This program is in Budget Activity 7, Operational System Development, because projects are being engineered to support already operational weapon systems.

(U) Acquisition Strategy:

All major contracts within this Program Element were awarded after full and open competition.

(U) FY 1997

- (U) 367 Develop detailed Product Line Master Plans.
- (U) 41 Update ATS Database.
- (U) 7 Program Management Support.
- (U) 2,846 SPARES Project - Congressional add
- (U) 3,261 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)	PROJECT 3759																																																							
<p>(U) <u>FY 1998</u> Not applicable. Program terminated.</p> <p>(U) <u>FY 1999</u> Not applicable. Program terminated.</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget FY 1998 PB</td> <td style="text-align: right;">3,261</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: right;">3,261</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">3,456</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Congressional/General Reductions</td> <td style="text-align: right;">-75</td> <td></td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-120</td> <td></td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Rescissions</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">3,261</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: right;">3,261</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 40px;">Funding: AFSEM efforts terminated at end of FY97.</p> <p style="padding-left: 40px;">Schedule: Not applicable.</p> <p style="padding-left: 40px;">Technical: Elimination of AFSEM funding will limit the ability of the ATS PGM to track and plan ATS development efficiently.</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u> Not applicable.</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget FY 1998 PB	3,261	0	0	3,261	(U) Appropriated Value	3,456				(U) Adjustments to Appropriated Value					a. Congressional/General Reductions	-75				b. SBIR	-120				c. Omnibus or Other Above Threshold Reprogramming					d. Below Threshold Reprogramming					e. Rescissions					(U) Adjustments to Budget Years Since FY 1998 PB					(U) Current Budget Submit/FY 1999 President's Budget	3,261	0	0	3,261
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																					
(U) Previous President's Budget FY 1998 PB	3,261	0	0	3,261																																																					
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(U) Current Budget Submit/FY 1999 President's Budget	3,261	0	0	3,261																																																					
Project 3759	Page 15 of 23 Pages	Exhibit R-2 (PE 0708611F)																																																							

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)										DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)					PROJECT 3759			
(U) D. <u>Schedule Profile</u>													
		<u>FY 1997</u>					<u>FY 1998</u>					<u>FY 1999</u>	
	1	2	3	4	1	2	3	4	1	2	3	4	
(U) Complete program management support				X									
(U) Complete update of ATS Database				X									
(U) Complete maintaining of ATS Database software				X									
(U) Complete development of detailed Product Line Master Plans (Continue)				X									

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)						DATE February 1998				
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)				PROJECT 3759		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U)	Develop detailed Product Line Master Plans.				367					
(U)	Update ATS Database.				41					
(U)	Program Management Support.				7					
(U)	SPARES Project - Congressional add				2,846					
(U)	Total				3,261					
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
General Atomics	FFP		N/A	N/A	0	2,846	0	0	0	2,846
SAIC		16 Jul 97	N/A	N/A	1,120	408	0	0	0	1,528
Various	Various	Various	N/A	N/A	363	0	0	0	0	363
<u>Support and Management Organizations</u>										
PC System	Desktop V	21 Jul 97	N/A	N/A	0	5	0	0	0	5
ESC	N/A	N/A	N/A	N/A	137	2	0	0	0	139
<u>Test and Evaluation Organizations</u>										
Not applicable.										
Government Furnished Property:										
Not applicable.										
Subtotal Product Development					1,483	3,254	0	0	0	4,737
Subtotal Support and Management					137	7	0	0	0	144
Subtotal Test and Evaluation					0	0	0	0	0	0
Project 3759					Page 17 of 23 Pages			Exhibit R-3 (PE 0708611F)		

DATE **February 1998**

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0708611F Support Systems Development (SSD)

Total Project	1,620	3,261	0	0	0	4,881
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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)								DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)				PROJECT 4654	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4654 Integrated Maintenance Data System (IMDS)*	17,222	0*	19,317	20,021	25,278	26,132	25,055	Continuing	Continuing
<p>* IMDS FY 98 funds (\$18.541 million) reside within PE 0603108F. Beyond FY 98, all IMDS funds reside within PE 0708611F, project 4654.</p> <p>(U) A. <u>Mission Description and Budget Item Justification</u> The IMDS program is an evolutionary acquisition program to develop and field an AF standard maintenance information system. This program element integrates information systems supporting Air Force maintenance activities into a single open architecture, modern decision support system. This enhanced decision support system will increase operational production capability and support system efficiency, while decreasing mobility infrastructure requirements and cost of operations. The IMDS System will be integrated with the Combat Support Information System (CSIS) being developed by the Global Combat Support System – Air Force (GCSS-AF) Program. IMDS integrates multiple and diverse maintenance Management Information Systems into a single open system client/server network. IMDS will provide a single virtual data repository for access by all Air Force command levels. Full IMDS capability is reached through six increments of the application software, each increment building on the previous one. The first increment entered test at Eglin AFB July 97 after one year of development. The second increment will enter test in Summer 98 with delivery starting to the field in 2nd Quarter FY98. Increments 1&2 establish core capabilities at the retail level. Increment 3 starts wholesale level functionality as well as continued expansion of retail capabilities. This program is Budget Activity 7, Operational System Development, because projects are being engineered to support already operational weapon systems.</p> <p>(U) <u>Acquisition Strategy:</u> All major contracts within this Program Element were awarded after full and open competition.</p> <p>(U) <u>FY 1997 (\$ in Thousands):</u></p> <ul style="list-style-type: none"> - (U) IMDS system contract - (U) \$12,419 Increment 1 (development & fielding of base-level beta version to Eglin AFB, migration of TICARRS (The Interim CAMS (Core Automated Maintenance System) and REMIS (Reliability and Maintainability Information System) Reporting System) functionality) - (U) \$900 Increment 2 (enhancement of beta version to core required capabilities for Eglin AFB, and Operational Test at Moody AFB) - (U) Operations - (U) \$2,078 Support Contractors (technical engineering & management support) - (U) \$1,825 SPO Operations (TDY, equipment, & supply) - (U) \$17,222 Total 									
Project 4654		Page 18 of 23 Pages				Exhibit R-2 (PE 0708611F)			

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
7 - Operational System Development	0708611F Support Systems Development (SSD)	4654
(U) FY 1998 (\$ in Thousands) (funding resides within PE 0603108F, project 4427):		
- (U)	IMDS system contract	
- (U) \$13,511	Increment 2 (continue enhancement of beta version to core required capabilities for Eglin AFB, and Operational Test at Moody AFB)	
- (U) \$788	Increment 3 (enhancement of backshop/full base-level requirements, initiation of REMIS (Reliability and Maintainability Information System) replacement)	
- (U)	Operations	
- (U) 2,459	Support Contractors (technical engineering & management support)	
- (U) 1,783	SPO Operations (TDY, equipment, & supply)	
- (U) \$18,541	Total	
(U) FY 1999 (\$ in Thousands):		
- (U)	IMDS system contract	
- (U) \$13,009	Increment 3 (continue enhancement of backshop/full base-level requirements, initiation of REMIS (Reliability and Maintainability Information System) replacement)	
- (U) \$3,300	Increment 4 (Complete REMIS functionality, initiate depot maintenance capabilities)	
- (U)	Operations	
- (U) 1,797	Support Contractors (technical engineering & management support)	
- (U) 1,211	SPO Operations (TDY, equipment, & supply)	
- (U) \$19,317	Total	
Project 4654	Page 19 of 23 Pages	Exhibit R-2 (PE 0708611F)

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 EXHIBIT)						DATE February 1998	
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)		PROJECT 4654	
(U) B. <u>Program Change Summary (\$ in Thousands)</u>							
		<u>FY 1997</u>		<u>FY 1998*</u>		<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget FY 1998 PB		0		0		0	Continuing
(U) Appropriated Value		0					
(U) Adjustments to Appropriated Value							
a. Congressional/General Reductions							
b. SBIR							
c. Omnibus or Other Above Threshold Reprogramming		17332					
d. Below Threshold Reprogramming		-44					
e. Rescissions		-66					
(U) Adjustments to Budget Years Since FY 1998 PB						19,317	
(U) Current Budget Submit/FY 1999 President's Budget		17,222		0		19,317	Continuing
 (U) Change Summary Explanation:							
Funding: * IMDS FY 98 funds (\$18.541 million) reside within PE 0603108F. Beyond FY 98, all IMDS funds reside within PE 0708611F, project 4654.							
Schedule: OT&E delayed one year due to funding cuts and Quadrennial Defense Review (QDR) impacts to beta sites and requirements changes.							
Technical: Not applicable.							
 (U) C. <u>Other Program Funding Summary (\$ in Thousands)</u>							
See page 2, C., Other Program Funding Summary.							
 (U) D. <u>Schedule Profile</u>							
		<u>FY 1997</u>		<u>FY 1998</u>		<u>FY 1999</u>	
	1	2	3	4	1	2	3
(U) Complete Development of IMDS core capability							X
(U) OT&E Core (Increments 1, 2, & 3)							X
(U) IMDS System Contract (Inc 3)						X	
Project 4654		Page 20 of 23 Pages				Exhibit R-2 (PE 0708611F)	

DATE
February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0708611F Support Systems Development (SSD)

	<u>FY 1997</u>				<u>FY 1998</u>				<u>FY 1999</u>			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) IMDS System Contract (Inc 4)												X

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0708611F Support Systems Development (SSD)	PROJECT 4654
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998*</u>	<u>FY 1999</u>
(U) IMDS System Contract	12,419		
Increment 1	900	13,511	
Increment 2		788	13,009
Increment 3			3,300
Increment 4			
(U) Operations			
Support Contractors	2,078	2,459	1,797
SPO Operations	1,825	1,783	1,211
(U) Total	17,222	18,541	19,317

* IMDS FY 98 funds (\$18.541 million) reside within PE 0603108F. Beyond FY 98, all IMDS funds reside within PE 0708611F, project 4654.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)								DATE		
BUDGET ACTIVITY								February 1998		
7 - Operational System Development					PE NUMBER AND TITLE			PROJECT		
					0708611F Support Systems Development (SSD)			4654		
Contractor or Government Performing <u>Activity</u>	Contract Method/Type or Funding <u>Vehicle</u>	Award or Obligation <u>Date</u>	Performing Activity <u>EAC</u>	Project Office <u>EAC</u>	Total Prior to <u>FY 1997</u>	Budget <u>FY 1997</u>	Budget <u>FY 1998</u>	Budget <u>FY 1999</u>	Budget to Complete	Total <u>Program</u>
Government Furnished Property: Not applicable.										
Subtotal Product Development					8,628	13,319	15,511	16,309	TBD	TBD
Subtotal Support and Management					13,962	3,903	3,030	3,008	TBD	TBD
Subtotal Test and Evaluation					0	0	0	0	0	0
Total Project					22,590	17,222	18,541	19,317	TBD	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0804734F Cryptologic/SIGINT Related Skill Training	PROJECT 1005
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
1005 Sentinel Bright Phase II	1,778	1,258	0	0	0	0	0	0	0
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

Provides funding required for the SENTINEL II (SII) Integration Program which is designed to complete the software development begun under SENTINEL BRIGHT II (SBII) and to automate and integrate the commercial off-the-shelf hardware and software purchased for SBII and SENTINEL ASPEN II (SAII) systems. SBII supports cryptologic analysts and maintenance personnel; SAII supports general military intelligence personnel. This program parallels the fielding of modernized operational intelligence systems and corrects long-standing deficiencies in training "mission ready" intelligence professionals. During FY 97, the program was refocused to a COTS integration effort. The remainder of the development effort will support COTS integration, and if COTS products do not satisfy requirements, development will be required. System integration will be completed in FY98. This program is in Budget Activity 7 because it is developing an automated training system/software which will be used to train intelligence professionals to accomplish their mission.

(U) Acquisition Strategy: SII was a modernization effort originally phased in blocks. During FY 97, the AF realized they could get a better product for the same amount of funding by using a COTS strategy, so they started using the IC4I contract which has three prime contractors. Bids will be solicited from each contractor on the IC4I contract for each phase of the COTS acquisition. The strategy is to use a spiral acquisition process, allowing for maximum upgrade capability and maintaining commonality with other training systems already in use at Goodfellow AFB while keeping requirements flexible and budget fixed.

(U) FY 1997 (\$ in Thousands):

- (U) \$150 SENTINEL II Contract: Maintained contractor's development facility/test bed
- (U) \$400 MITRE: Provided engineering support, operational requirements analysis, integration management, and risk assessment
- (U) \$100 46th Test Squadron: Provided test support for DT&E efforts
- (U) \$125 Program Office: Included various types of administrative support, including mission travel
- (U) \$1,003 IC4I Contract: Supported integration/extension of COTS products to meet requirements and development when COTS products alone did not satisfy requirements
- (U) \$1,778 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																		
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0804734F Cryptologic/SIGINT Related Skill Training	PROJECT 1005																																																		
<p>(U) <u>FY 1998 (\$ in Thousands):</u></p> <p>(U) \$647 IC4I Contract: Will complete COTS integration and development required to meet SII requirements</p> <p>(U) \$477 MITRE: Will provide engineering support, operational requirements analysis, integration management, and risk assessment</p> <p>(U) \$134 Program Office: Will include various types of administrative support including mission travel</p> <p>(U) \$1,258 Total</p> <p>(U) <u>FY 1999 (\$ in Thousands):</u></p> <p>(U) \$0 Total</p> <p>(U) B. <u>Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: right;">1,781</td> <td style="text-align: right;">1,427</td> <td style="text-align: right;">0</td> <td style="text-align: right;">7,900</td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: right;">1,887</td> <td style="text-align: right;">1,427</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> a. Cong Reductions</td> <td style="text-align: right;">-65</td> <td style="text-align: right;">-145</td> <td></td> <td></td> </tr> <tr> <td> b. SBIR</td> <td style="text-align: right;">-41</td> <td style="text-align: right;">-24</td> <td></td> <td></td> </tr> <tr> <td> c. Omnibus or Other Above Threshold Reprogram</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td> e. Recissions</td> <td style="text-align: right;">-3</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: right;">1,778</td> <td style="text-align: right;">1,258</td> <td style="text-align: right;">0</td> <td style="text-align: right;">7,330</td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">Funding: Changes due to Congressional reductions</p> <p style="padding-left: 20px;">Schedule: None</p> <p style="padding-left: 20px;">Technical: None</p> <p>(U) C. <u>Other Program Funding Summary (\$ in Thousands)</u></p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	1,781	1,427	0	7,900	(U) Appropriated Value	1,887	1,427			(U) Adjustments to Appropriated Value					a. Cong Reductions	-65	-145			b. SBIR	-41	-24			c. Omnibus or Other Above Threshold Reprogram					d. Below Threshold Reprogramming					e. Recissions	-3				(U) Current Budget Submit/FY 1999 President's Budget	1,778	1,258	0	7,330
	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>																																																
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e. Recissions	-3																																																			
(U) Current Budget Submit/FY 1999 President's Budget	1,778	1,258	0	7,330																																																
Project 1005		Exhibit R-2 (PE 0804734F)																																																		

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)										DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0804734F Cryptologic/SIGINT Related Skill Training					PROJECT 1005			
Not Applicable													
(U) D. <u>Schedule Profile</u>													
	FY 1997					FY 1998					FY 1999		
	1	2	3	4	1	2	3	4	1	2	3	4	
(U) Draft ORD				X									
(U) Begin SENTINEL STAR (SENTINEL Tech Arch and Replacement) Mods				X									
(U) Network Upgrade					X								
(U) Final ORD					X								
(U) COTS/Hardware Prototype							X						
(U) Install Classrooms									X				

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0804734F Cryptologic/SIGINT Related Skill Training			PROJECT 1005		
(U) A. <u>Project Cost Breakdown (\$ in Thousands)</u>										
					<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>			
(U) System Upgrade					1,003	647	0			
(U) System Engineering Development					400	477				
(U) Travel					40	50				
(U) Program Office Support					85	84				
(U) Test and Evaluation					100	0				
(U) Contract Development Facility					150	0				
(U) Total					1,778	1,258	0			
(U) B. <u>Budget Acquisition History and Planning Information (\$ in Thousands)</u>										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
<u>Product Development Organizations</u>										
(U) E-Systems	CPAF	Mar 93	N/A	N/A	2,184	150	0	0	0	2,334
(U) IC4I Contract	IDIQ	Apr 98	TBD	TBD	0	1,003	647	0	0	1,650
<u>Support and Management Organizations</u>										
(U) Program Support	N/A	N/A	N/A	N/A	564	125	134	0	0	823
(U) MITRE	T&M	Mar 93	N/A	N/A	1,546	400	477	0	0	2,423
<u>Test and Evaluation Organizations</u>										
Project 1005					Page 4 of 5 Pages			Exhibit R-3 (PE 0804734F)		

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 0804734F Cryptologic/SIGINT Related Skill Training				PROJECT 1005	
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
(U) 46 th Test Sqn	AF Form 616	TBD	N/A	N/A	0	100	0	0	0	100
Government Furnished Property: None										
Subtotal Product Development					2,184	1,153	647	0	0	3,984
Subtotal Support and Management					2,110	525	611	0	0	3,246
Subtotal Test and Evaluation					0	100	0	0	0	100
Total Project					4,294	1,778	1,258	0	0	7,330

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0901218F Civilian Compensation Program	PROJECT 4139
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COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
4139 Security Require Determination	6,261	6,285	6,756	6,973	7,210	7,119	7,149	0	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification

This program element provides for payment of civilian compensation benefits for disability due to personal injury sustained while in the performance of duty or due to employment-related disease according to the Federal Employees Compensation Act (FECA) under Title 5 U.S.C., Chapter 81. The Department of Labor (DOL) administers this program and charges the Department of the Air Force for its employee costs; therefore, this is a MUST PAY bill for Air Force. The PE excludes manpower authorizations and costs.

Acquisition Strategy:

(U) FY 1997 (\$ in Thousands):

- (U) \$6,261 Required to continue a program to compensate employees assigned to RDT&E facilities for worked-related injury or disease.
- (U) \$6,261* Total (Actual AF bill)

(U) FY 1998 (\$ in Thousands):

- (U) \$6,285 Required to continue a program to compensate employees assigned to RDT&E facilities for worked-related injury or disease
- (U) \$6,285 Total

(U) FY 1999 (\$ in Thousands):

- (U) \$6,756 Required to continue a program to compensate employees assigned to RDT&E facilities for worked-related injury or disease
- (U) \$6,756 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0901218F Civilian Compensation Program	PROJECT 4139
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(U) B. Program Change Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>
(U) Previous President's Budget	5,793	6,497	6,756	TBD
(U) Appropriated Value	5,917	6,497		
(U) Adjustments to Appropriated Value				
a. Cong Gen Reductions	-124	-212		
b. SBIR				
c. Omnibus or Other Above Threshold Reprogram				
d. Below Threshold Reprogramming	468			
e. Recession				
(U) Adjustments to Budget Years Since FY 1998 PB				
(U) Current Budget Submit/ FY 1999 President's Budget	6,261	6,285	6,756	TBD

(U) Change Summary Explanation:

Funding: Decreases in FY98 (-212) for civilian injury and unemployment compensation costs are due to medical inflation decreases and Consumer Price Index (CPI) decreases. This information was provided by the Department of Labor (DOL) based on their analysis of FY 97 Federal Employees Compensation Act (FECA) Chargeback costs. DOL administers this program and charges the Air Force for its employee's compensation costs; therefore, both programs are MUST PAY bills mandated by law (5 USC, Chapter 81).

Schedule: N/A

Technical: N/A

DATE
February 1998

BUDGET ACTIVITY
7 - Operational System Development

PE NUMBER AND TITLE
0901218F Civilian Compensation Program

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 0901218F Civilian Compensation Program	PROJECT 4139
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(U) C. Other Program Funding Summary (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>	<u>FY 2002</u>	<u>FY 2003</u>	<u>To Compl</u>	<u>Total Cost</u>
(U) Operation and Maintenance	21,283	21,562	22,355	22,679	23,528	25,245	25,759	0	TBD

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)							DATE February 1998		
BUDGET ACTIVITY 7 - Operational System Development				PE NUMBER AND TITLE 1001018F NATO JSTARS				PROJECT 0002	
COST (\$ In Thousands)	FY 1997 Actual	FY 1998 Estimate	FY 1999 Estimate	FY 2000 Estimate	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	Cost to Complete	Total Cost
0002 NATO JSTARS	5,975*	26,061	0	0	0	0	0	0	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

(U) A. Mission Description and Budget Item Justification
 NATO initiated the Alliance Ground Surveillance (AGS) program to provide NATO commanders near-real time surveillance and targeting information on moving and stationary ground targets (growth to maritime operations), slow moving rotary and fixed wing aircraft, and rotating antennas from airborne platforms. To meet these needs, the US proposed a "Fast Track" strategy comprised of the modification and enhancement of the US Joint Surveillance Target Attack Radar System (Joint STARS). The Conference of National Armament Directors (CNAD) postponed a decision on Alliance Ground Surveillance (AGS), directed the NATO Project Structure to intensively search for fresh concepts and acquisition options to meet the complete AGS capability, and report these new options at the April 1998 CNAD. The United States, in response to this direction, has proposed an option whereby NATO would develop and procure a system based on the ongoing US Joint STARS Radar Technology Insertion Program (RTIP) contained on a platform of NATO's choice. The US is conducting a feasibility study of this option during FY1998.

An evaluation of the tasks required to support the Government's ongoing efforts to find new alternatives resulted in a contract change proposal to the NATO Phase IV Study extending the period of performance through 31 May 1998 in lieu of January 1998 for support of additional tasks requested by OSD and for continuation of NATO Consultation Command and Control Agency (NC3A) activities. The NATO AGS Integrated Product Team (IPT) has determined that it is premature to develop and award a major new study effort prior to the next CNAD meeting. This program is in Budget Activity 7, Operational System Development, because it involves development on a system that has been operationally fielded.

(U) Acquisition Strategy -The U.S. and other NATO nations are developing fresh concepts and acquisition options to meet the AGS requirements, giving due consideration to an air segment made up of both NATO-owned and national assets, and a NATO-owned ground segment. The CNAD stipulated that these options be prepared for presentation to, and consideration by, the CNAD at its April 1998 meeting.

(U) FY 1997 (\$ in Thousands)

- (U) \$3,782 NATO Studies
- (U) \$25 Provisional Project Office
- (U) \$2,168 Other Government Costs (ESC/JPO Support)
- (U) \$5,975 Total

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RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)		DATE February 1998																																																							
BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 1001018F NATO JSTARS	PROJECT 0002																																																							
<p>(U) <u>FY 1998</u> (\$ in Thousands)</p> <ul style="list-style-type: none"> - (U) \$2,086 NATO Studies - (U) \$100 Provisional Project Office - (U) \$2,905 Other Government Cost (ESC/JPO Support) - (U) \$19,000 Pending Approval for Above Threshold Reprogramming - (U) \$24,091 Total <p>(U) <u>FY 1999</u> (\$ in Thousands)</p> <ul style="list-style-type: none"> - (U) \$0 Total <p>(Note: FY99 budget is established at \$0)</p> <p>(U) <u>B. Program Change Summary (\$ in Thousands)</u></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="text-align: center;"><u>FY 1997</u></th> <th style="text-align: center;"><u>FY 1998</u></th> <th style="text-align: center;"><u>FY 1999</u></th> <th style="text-align: center;"><u>Total Cost</u></th> </tr> </thead> <tbody> <tr> <td>(U) Previous President's Budget (FY 1998 PB)</td> <td style="text-align: center;">0</td> <td style="text-align: center;">36,061</td> <td style="text-align: center;">0</td> <td></td> </tr> <tr> <td>(U) Appropriated Value</td> <td style="text-align: center;">0</td> <td style="text-align: center;">26,061</td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Appropriated Value</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">a. Cong Gen Reductions</td> <td style="text-align: center;">-25</td> <td style="text-align: center;">-1355</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">b. SBIR</td> <td style="text-align: center;">-158</td> <td style="text-align: center;">-615</td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">c. Omnibus or Other Above Threshold Reprogram</td> <td style="text-align: center;">*6,168</td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">d. Below Threshold Reprogramming</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="padding-left: 20px;">e. Rescissions</td> <td style="text-align: center;">-10</td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Adjustments to Budget Years Since FY 1998 PB</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>(U) Current Budget Submit/FY 1999 President's Budget</td> <td style="text-align: center;">5,975</td> <td style="text-align: center;">**24,091</td> <td style="text-align: center;">0</td> <td></td> </tr> </tbody> </table> <p>(U) Change Summary Explanation:</p> <p style="padding-left: 20px;">(U) Funding: *FY97 Appropriation Act provided \$6.3 Million for Joint STARS, PE64770, in support of the initial NATO AGS effort. Funds were reclassified (1415-3) from PE 64770F into A1018F. **Portion of current budget (\$19,000) awaiting AF reprogramming.</p> <p style="padding-left: 20px;">(U) Schedule: None</p> <p style="padding-left: 20px;">(U) Technical: None</p>				<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>	<u>Total Cost</u>	(U) Previous President's Budget (FY 1998 PB)	0	36,061	0		(U) Appropriated Value	0	26,061			(U) Adjustments to Appropriated Value					a. Cong Gen Reductions	-25	-1355			b. SBIR	-158	-615			c. Omnibus or Other Above Threshold Reprogram	*6,168				d. Below Threshold Reprogramming					e. Rescissions	-10				(U) Adjustments to Budget Years Since FY 1998 PB					(U) Current Budget Submit/FY 1999 President's Budget	5,975	**24,091	0	
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Project 0002	Page 2 of 5 Pages	Exhibit R-2 (PE 1001018F)																																																							

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2 Exhibit)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 1001018F NATO JSTARS	PROJECT 0002
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(U) C. Other Program Funding Summary (\$ in Thousands)

None.

(U) D. Schedule Profile

	FY 1998				FY 1999				FY 2000			
	1	2	3	4	1	2	3	4	1	2	3	4
(U) CNAD Decision			X									
(U) Completion of Phase IV			X									

Legend:

- X- Denotes Planned Activity
- * - Denotes Completed Activity

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)	DATE February 1998
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BUDGET ACTIVITY 7 - Operational System Development	PE NUMBER AND TITLE 1001018F NATO JSTARS	PROJECT 0002
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(U) A. Project Cost Breakdown (\$ in Thousands)

	<u>FY 1997</u>	<u>FY 1998</u>	<u>FY 1999</u>
(U) NATO Studies	3,782	2,086	0
(U) Provisional Project Office (PPO)	25	100	0
(U) Other Government Costs	2,168	2,905	0
(U) Awaiting AF Reprogramming Actions		19,000	
(U) Total	5,975	24,091	0

NOTE: FY1999 and out budgets will be dependent upon CNAD decision in Apr 98.

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RDT&E PROGRAM ELEMENT/PROJECT COST BREAKDOWN (R-3)							DATE February 1998			
BUDGET ACTIVITY 7 - Operational System Development					PE NUMBER AND TITLE 1001018F NATO JSTARS			PROJECT 0002		
(U) B. Budget Acquisition History and Planning Information (\$ in Thousands)										
Performing Organizations:										
Contractor or Government Performing Activity	Contract Method/Type or Funding Vehicle	Award or Obligation Date	Performing Activity EAC	Project Office EAC	Total Prior to FY 1997	Budget FY 1997	Budget FY 1998	Budget FY 1999	Budget to Complete	Total Program
Northrop Grumman	Fixed Price	Apr 96			2,478	0	0	0	0	2,478
Rome Labs	Fixed Price	Sep 96			485	0	0	0	0	485
Northrop Grumman	Fixed Price	Jan 97				3,782	0	0	0	3,782
Northrop Grumman	TBD	Jan 98					2,086	0	0	2,000
Various Contracts	TBD						*19,000			
<u>Product Development Organizations</u>										
ESC (Provisional Project Office)								100		100
<u>Support and Management Organizations</u>										
MITRE	Cost Plus Award Fee	Oct 94/ Jun 96			518	739	785			
TEMS	IDIQ	Mar - May 96			476	757	1,197			
Miscellaneous	Various Contracts				324	697	923			
<u>Total Project</u>					4,281	5,975	24,091			
<u>Test and Evaluation Organizations</u>										
Government Furnished Property: None										

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