Department of Defense
Fiscal Year (FY) 2022 Budget Estimates

May 2021

Air Force

Justification Book Volume 1 of 1

Research, Development, Test & Evaluation, Space Force

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Volume 1 Table of Contents

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Fiscal Year (FY) 2022 Budget Estimates
RDT&E Descriptive Summaries
Budget Activities
May 2021

INTRODUCTION AND EXPLANATION OF CONTENTS

GENERAL

- This document has been prepared to provide information on the United States Space Force (USSF) Research, Development, Test and Evaluation (RDT&E) program elements and projects in the FY 2022 President's Budget (PB).
    - All exhibits in this document have been assembled in accordance with DoD 7000.14R, Financial Management Regulation, Volume 2B, Chapter 5.
    - Other comments on exhibit contents in this document:
        - Exhibits R-2/2a and R-3 provide narrative information for all RDT&E program elements and projects within the USAF FY 2022 RDT&E program with the exception of classified program elements. The format and contents of this document are in accordance to the guidelines and requirements of the Congressional committees in so far as possible.
        - The "Other Program Funding Summary portion of the R-2 includes, in addition to RDTE& 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.

CLASSIFICATION

- All exhibits contained in Volumes I, II, and III are unclassified. Classified exhibits are not included in the submission due to the level of security classification and necessity of special security clearances.

Exhibit footnotes for FY 2020 actuals and FY 2021 Enacted:

a. FY 2020 Actuals: **"Includes Division A, Title IX and X of the Consolidated Appropriations Act, 2020 (P.L. 116-93), Division F, Title IV and V from the Further Consolidated Appropriations Act, 2020 (P.L. 116-94) and the Coronavirus Aid, Relief, and Economic Security Act (P.L. 116-136)."**

b. FY 2021 Enacted (for every appropriation except O&M, Army, O&M, Navy, and O&M, AF): **"Includes Division C, Title IX and Division J, Title IV of the Consolidated Appropriations Act, 2021 (P.L. 116-260)."**

c. FY 2021 Enacted (for O&M, Army, O&M, Navy, and O&M, AF): "Includes Division C, Title IX and Division J, Title IV of the Consolidated Appropriations Act, 2021 (P.L. 116-260) and funds provided by the Congress as OCO to Base Requirements in O&M Army, O&M Navy, and O&M AF."

Department of the Air Force
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

05 May 2021

Summary Recap of Budget Activities	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request
Applied Research		216,874	175,796
Advanced Technology Development			76,653
Advanced Component Development & Prototypes		1,366,409	1,579,433
System Development & Demonstration		3,748,516	3,339,325
Management Support		273,510	355,642
Operational System Development		4,785,018	5,585,009
Software & Digital Technology Pilot Programs		149,742	154,529
Total Research, Development, Test & Evaluation		10,540,069	11,266,387

Summary Recap of FYDP Programs			
Space		6,882,703	6,791,578
Classified Programs		3,657,366	4,474,809
Total Research, Development, Test & Evaluation		10,540,069	11,266,387

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 5, 2021 at 14:49:13

Department of the Air Force
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

05 May 2021

Appropriation: 3620F RDTE, Space Force

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
1	1206601SF	Space Technology	02		216,874	175,796	U
		Applied Research			216,874	175,796	
2	1206616SF	Space Advanced Technology Development/Demo	03			76,653	U
		Advanced Technology Development				76,653	
3	1203164SF	NAVSTAR Global Positioning System (User Equipment) (SPACE)	04		380,704	434,194	U
4	1203710SF	EO/IR Weather Systems	04		131,000	162,274	U
5	1203905SF	Space System Support	04			37,000	U
6	1206422SF	Weather System Follow-on	04		83,384	61,521	U
7	1206425SF	Space Situation Awareness Systems	04		33,359	123,262	U
8	1206427SF	Space Systems Prototype Transitions (SSPT)	04		151,595	101,851	U
9	1206438SF	Space Control Technology	04		40,575	32,931	U
10	1206730SF	Space Security and Defense Program	04		56,311	56,546	U
11	1206760SF	Protected Tactical Enterprise Service (PTES)	04		109,390	100,320	U
12	1206761SF	Protected Tactical Service (PTS)	04		200,178	243,285	U
13	1206855SF	Evolved Strategic SATCOM (ESS)	04		71,395	160,056	U
14	1206857SF	Space Rapid Capabilities Office	04		108,518	66,193	U
		Advanced Component Development & Prototypes			1,366,409	1,579,433	
15	1203269SF	GPS III Follow-On (GPS IIIF)	05		285,496	264,265	U
16	1203940SF	Space Situation Awareness Operations	05		36,897	56,279	U
17	1206421SF	Counterspace Systems	05		57,189	38,063	U
18	1206422SF	Weather System Follow-on	05		2,526	1,438	U

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Department of the Air Force
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

05 May 2021

Appropriation: 3620F RDTE, Space Force

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
19	1206425SF	Space Situation Awareness Systems	05		173,074	127,026	U
20	1206431SF	Advanced EHF MILSATCOM (SPACE)	05		90,045	28,218	U
21	1206432SF	Polar MILSATCOM (SPACE)	05		190,235	127,870	U
22	1206442SF	Next Generation OPIR	05		2,318,864	2,451,256	U
23	1206445SF	Commercial SATCOM (COMSATCOM) Integration	05		43,212	23,400	U
24	1206853SF	National Security Space Launch Program (SPACE) - EMD	05		550,978	221,510	U
		System Development & Demonstration			3,748,516	3,339,325	
25	1206116SF	Space Test and Training Range Development	06		20,281	19,319	U
26	1206392SF	ACQ Workforce - Space & Missile Systems	06		183,930	214,051	U
27	1206398SF	Space & Missile Systems Center - MHA	06		9,765	12,119	U
28	1206759SF	Major T&E Investment - Space	06			71,503	U
29	1206860SF	Rocket Systems Launch Program (SPACE)	06		17,993	17,769	U
30	1206862SF	Tactically Responsive Launch	06		15,000		U
31	1206864SF	Space Test Program (STP)	06		26,541	20,881	U
		Management Support			273,510	355,642	
33	1201017SF	Global Sensor Integrated on Network (GSIN)	07		5,597	4,731	U
34	1203001SF	Family of Advanced BLoS Terminals (FAB-T)	07		232,229	156,788	U
35	1203040SF	DCO-Space	07			2,150	U
36	1203109SF	Narrowband Satellite Communications	07			112,012	U
37	1203110SF	Satellite Control Network (SPACE)	07		60,480	36,810	U
38	1203165SF	NAVSTAR Global Positioning System (Space and Control Segments)	07		1,984	1,966	U

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Department of the Air Force
FY 2022 President's Budget
Exhibit R-1 FY 2022 President's Budget
Total Obligational Authority
(Dollars in Thousands)

05 May 2021

Appropriation: 3620F RDTE, Space Force

Line No	Program Element Number	Item	Act	FY 2020 Actual*	FY 2021 Enacted**	FY 2022 Request	Sec
39	1203173SF	Space and Missile Test and Evaluation Center	07		4,397	1,699	U
40	1203174SF	Space Innovation, Integration and Rapid Technology Development	07		38,746	18,054	U
41	1203182SF	Spacelift Range System (SPACE)	07		21,020	11,115	U
42	1203265SF	GPS III Space Segment	07		10,777	7,207	U
43	1203330SF	Space Superiority ISR	07		16,810	18,109	U
44	1203620SF	National Space Defense Center	07		2,687	1,280	U
45	1203873SF	Ballistic Missile Defense Radars	07		28,179	12,292	U
46	1203906SF	NCMC - TW/AA System	07		6,990	9,858	U
47	1203913SF	NUDET Detection System (SPACE)	07		29,157	45,887	U
48	1203940SF	Space Situation Awareness Operations	07		69,809	64,763	U
49	1206423SF	Global Positioning System III - Operational Control Segment	07		481,999	413,766	U
53	1206770SF	Enterprise Ground Services	07		116,791	191,713	U
9999	9999999999	Classified Programs			3,657,366	4,474,809	U
		Operational System Development			4,785,018	5,585,009	
54	1203614SF	JSpOC Mission System	08		149,742	154,529	U
		Software & Digital Technology Pilot Programs			149,742	154,529	
		Total RDTE, Space Force			10,540,069	11,266,387	

R-122BAS: FY 2022 President's Budget (Total Base Published Version), as of May 5, 2021 at 14:49:13

Program Element Table of Contents (by Budget Activity then Line Item Number)

Appropriation 3620F: Research, Development, Test & Evaluation, Space Force

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Appropriation 3620F: Research, Development, Test & Evaluation, Space Force

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Program Element Table of Contents (Alphabetically by Program Element Title)

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SF, RDT&E Civilian Personnel: $ in Whole Numbers			Average Work Year Cost (AWYC)			Full Time Equivalents (FTEs)		
BLIN	**BLI/PE**	**BLI/PE Title**	**FY20 EOY**	**FY21 Enacted**	**FY22PB**	**FY20 EOY**	**FY21 Enacted**	**FY22PB**
BUDGET ACTIVITY 06: RDT&E Management Support								
26	1206392SF	Space and Missile Center (SMC) Civilian Workforce	142,000	144,800	151,931	1,319	1,500	1,468
27	1206398SF	Space & Missile Systems Center - MHA	159,400	162,300	161,587	62	75	75
1	1206601SF	Space Technology	141,862	146,618	146,313	387	445	568

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RDTE, Space Force

Date: May 2021

Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
FY 2022 President Biden Budget
(FY 2020)

	a Begin Strength	b End Strength	c FTEs	d Basic Comp	e Overtime Pay	f Holiday Pay	g Other O.C.11	h Total Variables
Direct Funded Personnel (includes OC 13)								
D1. US Direct Hire (USDH)								
D1a. Senior Executive Schedule								
D1b. General Schedule								
D1c. Special Schedule								
D1d. Wage System								
D1e. Highly Qualified Experts								
D1f. Other								
D2. Direct Hire Program Foreign Nationals (DHFN)								
D3. Total Direct Hire								
D4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Direct Funded (excludes OC 13)								
D5. Other Object Class 13 Benefits								
D5a. USDH - Benefits for Former Employees								
D5b. DHFN - Benefits for Former Employees								
D5c. Voluntary Separation Incentive Pay (VSIP)								
D5d. Foreign National Separation Liability Accrual								
Reimbursable Funded Personnel (includes OC 13)								
R1. US Direct Hire (USDH)								
R1a. Senior Executive Schedule								
R1b. General Schedule								
R1c. Special Schedule								
R1d. Wage System								
R1e. Highly Qualified Experts								
R1f. Other								
R2. Direct Hire Program Foreign Nationals (DHFN)								
R3. Total Direct Hire								
R4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Reimbursable Funded (excludes OC 13)								
R5. Other Object Class 13 Benefits								
R5a. USDH - Benefits for Former Employees								
R5b. DHFN - Benefits for Former Employees								
R5c. Voluntary Separation Incentive Pay (VSIP)								
R5d. Foreign National Separation Liability Accrual								

RDTE, Space Force

Date: May 2021

Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
FY 2022 President Biden Budget
(FY 2020)

	i Comp O.C.11	j Benefits O.C.12/13	k Comp & Benefits	l Basic Comp	m Total Comp	n Comp & Benefits	o % BC Variables	p % BC Benefits
Direct Funded Personnel (includes OC 13)								
D1. US Direct Hire (USDH)								
D1a. Senior Executive Schedule								
D1b. General Schedule								
D1c. Special Schedule								
D1d. Wage System								
D1e. Highly Qualified Experts								
D1f. Other								
D2. Direct Hire Program Foreign Nationals (DHFN)								
D3. Total Direct Hire								
D4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Direct Funded (excludes OC 13)								
D5. Other Object Class 13 Benefits								
D5a. USDH - Benefits for Former Employees								
D5b. DHFN - Benefits for Former Employees								
D5c. Voluntary Separation Incentive Pay (VSIP)								
D5d. Foreign National Separation Liability Accrual								
Reimbursable Funded Personnel (includes OC 13)								
R1. US Direct Hire (USDH)								
R1a. Senior Executive Schedule								
R1b. General Schedule								
R1c. Special Schedule								
R1d. Wage System								
R1e. Highly Qualified Experts								
R1f. Other								
R2. Direct Hire Program Foreign Nationals (DHFN)								
R3. Total Direct Hire								
R4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Reimbursable Funded (excludes OC 13)								
R5. Other Object Class 13 Benefits								
R5a. USDH - Benefits for Former Employees								
R5b. DHFN - Benefits for Former Employees								
R5c. Voluntary Separation Incentive Pay (VSIP)								
R5d. Foreign National Separation Liability Accrual								

RDTE, Space Force

Date: May 2021

Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
FY 2022 President Biden Budget
(FY 2020)

	a Begin Strength	b End Strength	c FTEs	d Basic Comp	e Overtime Pay	f Holiday Pay	g Other O.C.11	h Total Variables
Total Funded Personnel (includes OC 13)								
T1. US Direct Hire (USDH)								
T1a. Senior Executive Schedule								
T1b. General Schedule								
T1c. Special Schedule								
T1d. Wage System								
T1e. Highly Qualified Experts								
T1f. Other								
T2. Direct Hire Program Foreign Nationals (DHFN)								
T3. Total Direct Hire								
T4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Total Funded (excludes OC 13)								
T5. Other Object Class 13 Benefits								
T5a. USDH - Benefits for Former Employees								
T5b. DHFN - Benefits for Former Employees								
T5c. Voluntary Separation Incentive Pay (VSIP)								
T5d. Foreign National Separation Liability Accrual								

RDTE, Space Force

Date: May 2021

Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
FY 2022 President Biden Budget
(FY 2020)

	i Comp O.C.11	j Benefits O.C.12/13	k Comp & Benefits	l Basic Comp	m Total Comp	n Comp & Benefits	o % BC Variables	p % BC Benefits
Total Funded Personnel (includes OC 13)								
T1. US Direct Hire (USDH)								
T1a. Senior Executive Schedule								
T1b. General Schedule								
T1c. Special Schedule								
T1d. Wage System								
T1e. Highly Qualified Experts								
T1f. Other								
T2. Direct Hire Program Foreign Nationals (DHFN)								
T3. Total Direct Hire								
T4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Total Funded (excludes OC 13)								
T5. Other Object Class 13 Benefits								
T5a. USDH - Benefits for Former Employees								
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T5c. Voluntary Separation Incentive Pay (VSIP)								
T5d. Foreign National Separation Liability Accrual								

RDTE, Space Force

Date: May 2021

Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
FY 2022 President Biden Budget
(FY 2021)

	a Begin Strength	b End Strength	c FTEs	d Basic Comp	e Overtime Pay	f Holiday Pay	g Other O.C.11	h Total Variables
Direct Funded Personnel (includes OC 13)	1,972	1,972	1,972	194,958	225	137	4,474	4,836
D1. US Direct Hire (USDH)	1,972	1,972	1,972	194,958	225	137	4,474	4,836
D1a. Senior Executive Schedule								
D1b. General Schedule	1,972	1,972	1,972	194,958	225	137	4,474	4,836
D1c. Special Schedule								
D1d. Wage System								
D1e. Highly Qualified Experts								
D1f. Other								
D2. Direct Hire Program Foreign Nationals (DHFN)								
D3. Total Direct Hire	1,972	1,972	1,972	194,958	225	137	4,474	4,836
D4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Direct Funded (excludes OC 13)	1,972	1,972	1,972	194,958	225	137	4,474	4,836
D5. Other Object Class 13 Benefits								
D5a. USDH - Benefits for Former Employees								
D5b. DHFN - Benefits for Former Employees								
D5c. Voluntary Separation Incentive Pay (VSIP)								
D5d. Foreign National Separation Liability Accrual								
Reimbursable Funded Personnel (includes OC 13)	48	48	48	4,746	5	3	109	117
R1. US Direct Hire (USDH)	48	48	48	4,746	5	3	109	117
R1a. Senior Executive Schedule								
R1b. General Schedule	48	48	48	4,746	5	3	109	117
R1c. Special Schedule								
R1d. Wage System								
R1e. Highly Qualified Experts								
R1f. Other								
R2. Direct Hire Program Foreign Nationals (DHFN)								
R3. Total Direct Hire	48	48	48	4,746	5	3	109	117
R4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Reimbursable Funded (excludes OC 13)	48	48	48	4,746	5	3	109	117
R5. Other Object Class 13 Benefits								
R5a. USDH - Benefits for Former Employees								
R5b. DHFN - Benefits for Former Employees								
R5c. Voluntary Separation Incentive Pay (VSIP)								
R5d. Foreign National Separation Liability Accrual								

RDTE, Space Force

Date: May 2021

Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
FY 2022 President Biden Budget
(FY 2021)

	i Comp O.C.11	j Benefits O.C.12/13	k Comp & Benefits	l Basic Comp	m Total Comp	n Comp & Benefits	o % BC Variables	p % BC Benefits
Direct Funded Personnel (includes OC 13)	199,794	56,951	256,745	98,863	101,315	130,195	2.5%	29.2%
D1. US Direct Hire (USDH)	199,794	56,951	256,745	98,863	101,315	130,195	2.5%	29.2%
D1a. Senior Executive Schedule								
D1b. General Schedule	199,794	56,951	256,745	98,863	101,315	130,195	2.5%	29.2%
D1c. Special Schedule								
D1d. Wage System								
D1e. Highly Qualified Experts								
D1f. Other								
D2. Direct Hire Program Foreign Nationals (DHFN)								
D3. Total Direct Hire	199,794	56,951	256,745	98,863	101,315	130,195	2.5%	29.2%
D4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Direct Funded (excludes OC 13)	199,794	56,951	256,745	98,863	101,315	130,195	2.5%	29.2%
D5. Other Object Class 13 Benefits								
D5a. USDH - Benefits for Former Employees								
D5b. DHFN - Benefits for Former Employees								
D5c. Voluntary Separation Incentive Pay (VSIP)								
D5d. Foreign National Separation Liability Accrual								
Reimbursable Funded Personnel (includes OC 13)	4,863	1,386	6,249	98,875	101,313	130,188	2.5%	29.2%
R1. US Direct Hire (USDH)	4,863	1,386	6,249	98,875	101,313	130,188	2.5%	29.2%
R1a. Senior Executive Schedule								
R1b. General Schedule	4,863	1,386	6,249	98,875	101,313	130,188	2.5%	29.2%
R1c. Special Schedule								
R1d. Wage System								
R1e. Highly Qualified Experts								
R1f. Other								
R2. Direct Hire Program Foreign Nationals (DHFN)								
R3. Total Direct Hire	4,863	1,386	6,249	98,875	101,313	130,188	2.5%	29.2%
R4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Reimbursable Funded (excludes OC 13)	4,863	1,386	6,249	98,875	101,313	130,188	2.5%	29.2%
R5. Other Object Class 13 Benefits								
R5a. USDH - Benefits for Former Employees								
R5b. DHFN - Benefits for Former Employees								
R5c. Voluntary Separation Incentive Pay (VSIP)								
R5d. Foreign National Separation Liability Accrual								

RDTE, Space Force

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Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
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(FY 2021)

	a Begin Strength	b End Strength	c FTEs	d Basic Comp	e Overtime Pay	f Holiday Pay	g Other O.C.11	h Total Variables
Total Funded Personnel (includes OC 13)	2,020	2,020	2,020	199,704	230	140	4,583	4,953
T1. US Direct Hire (USDH)	2,020	2,020	2,020	199,704	230	140	4,583	4,953
T1a. Senior Executive Schedule								
T1b. General Schedule	2,020	2,020	2,020	199,704	230	140	4,583	4,953
T1c. Special Schedule								
T1d. Wage System								
T1e. Highly Qualified Experts								
T1f. Other								
T2. Direct Hire Program Foreign Nationals (DHFN)								
T3. Total Direct Hire	2,020	2,020	2,020	199,704	230	140	4,583	4,953
T4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Total Funded (excludes OC 13)	2,020	2,020	2,020	199,704	230	140	4,583	4,953
T5. Other Object Class 13 Benefits								
T5a. USDH - Benefits for Former Employees								
T5b. DHFN - Benefits for Former Employees								
T5c. Voluntary Separation Incentive Pay (VSIP)								
T5d. Foreign National Separation Liability Accrual								

Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
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(FY 2021)

	i Comp O.C.11	j Benefits O.C.12/13	k Comp & Benefits	l Basic Comp	m Total Comp	n Comp & Benefits	o % BC Variables	p % BC Benefits
Total Funded Personnel (includes OC 13)	204,657	58,337	262,994	98,863	101,315	130,195	2.5%	29.2%
T1. US Direct Hire (USDH)	204,657	58,337	262,994	98,863	101,315	130,195	2.5%	29.2%
T1a. Senior Executive Schedule								
T1b. General Schedule	204,657	58,337	262,994	98,863	101,315	130,195	2.5%	29.2%
T1c. Special Schedule								
T1d. Wage System								
T1e. Highly Qualified Experts								
T1f. Other								
T2. Direct Hire Program Foreign Nationals (DHFN)								
T3. Total Direct Hire	204,657	58,337	262,994	98,863	101,315	130,195	2.5%	29.2%
T4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Total Funded (excludes OC 13)	204,657	58,337	262,994	98,863	101,315	130,195	2.5%	29.2%
T5. Other Object Class 13 Benefits								
T5a. USDH - Benefits for Former Employees								
T5b. DHFN - Benefits for Former Employees								
T5c. Voluntary Separation Incentive Pay (VSIP)								
T5d. Foreign National Separation Liability Accrual								

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Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
FY 2022 President Biden Budget
(FY 2022)

	a Begin Strength	b End Strength	c FTEs	d Basic Comp	e Overtime Pay	f Holiday Pay	g Other O.C.11	h Total Variables
Direct Funded Personnel (includes OC 13)	1,972	2,158	2,138	232,332	267	163	5,332	5,762
D1. US Direct Hire (USDH)	1,972	2,158	2,138	232,332	267	163	5,332	5,762
D1a. Senior Executive Schedule								
D1b. General Schedule	1,972	2,158	2,138	232,332	267	163	5,332	5,762
D1c. Special Schedule								
D1d. Wage System								
D1e. Highly Qualified Experts								
D1f. Other								
D2. Direct Hire Program Foreign Nationals (DHFN)								
D3. Total Direct Hire	1,972	2,158	2,138	232,332	267	163	5,332	5,762
D4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Direct Funded (excludes OC 13)	1,972	2,158	2,138	232,332	267	163	5,332	5,762
D5. Other Object Class 13 Benefits								
D5a. USDH - Benefits for Former Employees								
D5b. DHFN - Benefits for Former Employees								
D5c. Voluntary Separation Incentive Pay (VSIP)								
D5d. Foreign National Separation Liability Accrual								
Reimbursable Funded Personnel (includes OC 13)	48	37	46	9,338	11	7	214	232
R1. US Direct Hire (USDH)	48	37	46	9,338	11	7	214	232
R1a. Senior Executive Schedule								
R1b. General Schedule	48	37	46	9,338	11	7	214	232
R1c. Special Schedule								
R1d. Wage System								
R1e. Highly Qualified Experts								
R1f. Other								
R2. Direct Hire Program Foreign Nationals (DHFN)								
R3. Total Direct Hire	48	37	46	9,338	11	7	214	232
R4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Reimbursable Funded (excludes OC 13)	48	37	46	9,338	11	7	214	232
R5. Other Object Class 13 Benefits								
R5a. USDH - Benefits for Former Employees								
R5b. DHFN - Benefits for Former Employees								
R5c. Voluntary Separation Incentive Pay (VSIP)								
R5d. Foreign National Separation Liability Accrual								

RDTE, Space Force

Date: May 2021

Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
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(FY 2022)

	i Comp O.C.11	j Benefits O.C.12/13	k Comp & Benefits	l Basic Comp	m Total Comp	n Comp & Benefits	o % BC Variables	p % BC Benefits
Direct Funded Personnel (includes OC 13)	238,094	67,869	305,963	108,668	111,363	143,107	2.5%	29.2%
D1. US Direct Hire (USDH)	238,094	67,869	305,963	108,668	111,363	143,107	2.5%	29.2%
D1a. Senior Executive Schedule								
D1b. General Schedule	238,094	67,869	305,963	108,668	111,363	143,107	2.5%	29.2%
D1c. Special Schedule								
D1d. Wage System								
D1e. Highly Qualified Experts								
D1f. Other								
D2. Direct Hire Program Foreign Nationals (DHFN)								
D3. Total Direct Hire	238,094	67,869	305,963	108,668	111,363	143,107	2.5%	29.2%
D4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Direct Funded (excludes OC 13)	238,094	67,869	305,963	108,668	111,363	143,107	2.5%	29.2%
D5. Other Object Class 13 Benefits								
D5a. USDH - Benefits for Former Employees								
D5b. DHFN - Benefits for Former Employees								
D5c. Voluntary Separation Incentive Pay (VSIP)								
D5d. Foreign National Separation Liability Accrual								
Reimbursable Funded Personnel (includes OC 13)	9,570	2,728	12,298	203,000	208,043	267,348	2.5%	29.2%
R1. US Direct Hire (USDH)	9,570	2,728	12,298	203,000	208,043	267,348	2.5%	29.2%
R1a. Senior Executive Schedule								
R1b. General Schedule	9,570	2,728	12,298	203,000	208,043	267,348	2.5%	29.2%
R1c. Special Schedule								
R1d. Wage System								
R1e. Highly Qualified Experts								
R1f. Other								
R2. Direct Hire Program Foreign Nationals (DHFN)								
R3. Total Direct Hire	9,570	2,728	12,298	203,000	208,043	267,348	2.5%	29.2%
R4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Reimbursable Funded (excludes OC 13)	9,570	2,728	12,298	203,000	208,043	267,348	2.5%	29.2%
R5. Other Object Class 13 Benefits								
R5a. USDH - Benefits for Former Employees								
R5b. DHFN - Benefits for Former Employees								
R5c. Voluntary Separation Incentive Pay (VSIP)								
R5d. Foreign National Separation Liability Accrual								

RDTE, Space Force

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	a Begin Strength	b End Strength	c FTEs	d Basic Comp	e Overtime Pay	f Holiday Pay	g Other O.C.11	h Total Variables
Total Funded Personnel (includes OC 13)	2,020	2,195	2,184	241,670	278	170	5,546	5,994
T1. US Direct Hire (USDH)	2,020	2,195	2,184	241,670	278	170	5,546	5,994
T1a. Senior Executive Schedule								
T1b. General Schedule	2,020	2,195	2,184	241,670	278	170	5,546	5,994
T1c. Special Schedule								
T1d. Wage System								
T1e. Highly Qualified Experts								
T1f. Other								
T2. Direct Hire Program Foreign Nationals (DHFN)								
T3. Total Direct Hire	2,020	2,195	2,184	241,670	278	170	5,546	5,994
T4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Total Funded (excludes OC 13)	2,020	2,195	2,184	241,670	278	170	5,546	5,994
T5. Other Object Class 13 Benefits								
T5a. USDH - Benefits for Former Employees								
T5b. DHFN - Benefits for Former Employees								
T5c. Voluntary Separation Incentive Pay (VSIP)								
T5d. Foreign National Separation Liability Accrual								

RDTE, Space Force

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Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
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(FY 2022)

	i Comp O.C.11	j Benefits O.C.12/13	k Comp & Benefits	l Basic Comp	m Total Comp	n Comp & Benefits	o % BC Variables	p % BC Benefits
Total Funded Personnel (includes OC 13)	247,664	70,597	318,261	110,655	113,399	145,724	2.5%	29.2%
T1. US Direct Hire (USDH)	247,664	70,597	318,261	110,655	113,399	145,724	2.5%	29.2%
T1a. Senior Executive Schedule								
T1b. General Schedule	247,664	70,597	318,261	110,655	113,399	145,724	2.5%	29.2%
T1c. Special Schedule								
T1d. Wage System								
T1e. Highly Qualified Experts								
T1f. Other								
T2. Direct Hire Program Foreign Nationals (DHFN)								
T3. Total Direct Hire	247,664	70,597	318,261	110,655	113,399	145,724	2.5%	29.2%
T4. Indirect Hire Foreign Nationals (IHFN)								
Subtotal - Total Funded (excludes OC 13)	247,664	70,597	318,261	110,655	113,399	145,724	2.5%	29.2%
T5. Other Object Class 13 Benefits								
T5a. USDH - Benefits for Former Employees								
T5b. DHFN - Benefits for Former Employees								
T5c. Voluntary Separation Incentive Pay (VSIP)								
T5d. Foreign National Separation Liability Accrual								

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 1206601SF / *Space Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	216.874	175.796	0.000	175.796	-	-	-	-	-	-
621010: *Space Survivability & Surveillance*	-	0.000	41.807	39.656	0.000	39.656	-	-	-	-	-	-
624846: *Spacecraft Payload Technologies*	-	0.000	29.796	31.150	0.000	31.150	-	-	-	-	-	-
624847: *Rocket Propulsion Technology*	-	0.000	0.000	15.046	0.000	15.046	-	-	-	-	-	-
624866: *Lasers & Imaging Technology*	-	0.000	0.000	16.824	0.000	16.824	-	-	-	-	-	-
625018: *Spacecraft Protection Technology*	-	0.000	11.639	12.427	0.000	12.427	-	-	-	-	-	-
628809: *Spacecraft Vehicle Technologies*	-	0.000	133.632	60.693	0.000	60.693	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This program focuses on six major areas. First, the space survivability and surveillance area develops technologies to understand space weather and the geophysics environment for mitigation and exploitation of these effects to Department of Air Force systems. Second, the spacecraft payload technologies area improves satellite payload operations by developing advanced component and subsystem capabilities. Third, the rocket propulsion technology area develops rocket propulsion technologies for space access, space maneuver, and the sustainment of strategic systems. Fourth, the lasers & imaging technology area conducts research supporting ground-based optical space domain awareness. Fifth, the spacecraft protection area develops technologies for protecting United States space assets in potential hostile settings. The last major area, spacecraft vehicles, focuses on spacecraft platform and control technologies, and their interactions. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

In FY 2022, the liquid engine combustion technologies, advanced liquid engine technologies, and on-orbit propulsion technologies efforts of PE 0602201F, Aerospace Vehicle Technologies, Project 624847, Rocket Propulsion Technology were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, Project 624847, Rocket Propulsion Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

In FY 2022, the optical space domain awareness and satellite vulnerability efforts of PE 0602605F, Directed Energy Technology, Project 624866, Lasers & Imagining Technology were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, Project 624866, Lasers & Imaging Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 0602298F, and 1206601SF.

Funds in this PE may be used to investigate specific technology advancements in air, space, and/or cyber domains.

This program is in Budget Activity 2, Applied Research because this budget activity includes studies, investigations, and non-system specific technology efforts directed toward general military needs with a view toward developing and evaluating the feasibility and practicality of proposed solutions and determining their parameters.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	130.874	176.662	0.000	176.662
Current President's Budget	0.000	216.874	175.796	0.000	175.796
Total Adjustments	0.000	86.000	-0.866	0.000	-0.866
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	86.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-0.866	0.000	-0.866

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 628809: *Spacecraft Vehicle Technologies*		
Congressional Add: *Congressional Add: Program increase - operational cryogenic upper stage augmentation Kit*	0.000	7.000
Congressional Add: *Congressional Add: Program increase - thin-film photovoltaic energy*	0.000	7.000
Congressional Add: *Congressional Add: Program increase - hybrid space architecture*	0.000	10.000
Congressional Add: *Congressional Add: Program increase - resilient solar power*	0.000	3.000
Congressional Add: *Congressional Add: Program increase - ultra-lightweight solar arrays*	0.000	15.000
Congressional Add: *Congressional Add: Program increase - link-16 space experiment*	0.000	9.000
Congressional Add: *Congressional Add: Program increase - advanced space power systems*	0.000	7.000
Congressional Add: *Congressional Add: Program increase - digital engineering for future space systems*	0.000	5.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 1206601SF *I Space Technology*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Congressional Add: *Congressional Add: Program increase - laser communications*	0.000	12.000
Congressional Add: *Congressional Add: Program increase - lithium-sulfur battery development*	0.000	5.000
Congressional Add: *Congressional Add: Program increase - small satellite mission control facility*	0.000	6.000
Congressional Add Subtotals for Project: 628809	0.000	86.000
Congressional Add Totals for all Projects	0.000	86.000

Change Summary Explanation

Increase in FY 2022 due to efforts and civilian manpower of PE 0602201F, Aerospace Vehicle Technologies, Project 624847, Rocket Propulsion Technology, and PE 0602605F, Directed Energy Technology, Project 624866, Lasers & Imaging Technology, being transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / *Space Technology*	Project (Number/Name) 621010 / *Space Survivability & Surveillance*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
621010: *Space Survivability & Surveillance*	-	0.000	41.807	39.656	0.000	39.656	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This project develops technologies to understand and control the space environment for warfighter's future capabilities. The focus is on characterizing and forecasting the battlespace environment for more realistic space system design, modeling, and simulation, as well as the battlespace environment's effect on space systems' performance. This includes technologies to specify and forecast the space environment for planning operations, ensure uninterrupted system performance, optimize space-based surveillance operations, and provide capability to mitigate or exploit the space environment for both offensive and defensive operations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Environment Research	0.000	20.235	11.525

Description: Develop techniques, forecasting tools, sensors, and technologies for specifying, monitoring, predicting, and controlling space environmental conditions hazardous to Department of Defense operational space and radar systems.

FY 2021 Plans:

Continue exploitation and data collection of radiation aged materials for electrical and optical property changes to enhance predictive models. Identify and initiate generation-beyond-next trapped and untrapped particle specification model development efforts. Continue space environment sensor and anomaly attribution tool demonstrations to identify key model development requirements and transition roadblocks. Research and develop technologies to exploit and mitigate space environment effects to the Department of Defense's advantage. Prototype and demonstrate new ground-based and space-based sensors for monitoring and specifying the state of the space environment for military applications. Continue to develop and enhance space environment modelling capabilities to better enable accurate specification and forecasting of the state of the space environment, and the resulting impacts to Department of Defense and national systems. Advance research into the physics and dynamics of the sun to better specify and forecast solar events and better understand how those events impact the near-earth space environment. Explore fundamental radio frequency and chemical interactions in the near-earth space environment to inform potential utility for military applications. Continue work on hybrid supersonic solver code development and validation, expanding the solver to include accurate Global Positioning System performance.

FY 2022 Plans:

Complete exploitation of radiation aged materials to enhance predictive models. Continue developing generation-beyond-next trapped and untrapped particle specification model development efforts. Complete demonstrations of space environment sensor and anomaly attribution tool. Continue developing technologies to exploit and mitigate space environment effects. Continue to prototype and demonstrate new ground-based and space-based sensors for monitoring and specifying the state of the space environment for military applications, and continue to develop modelling capabilities to better enable accurate forecasting of the

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 621010 / *Space Survivability & Surveillance*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
state of the space environment. Continue research into the physics and dynamics of the sun to better specify and forecast solar events and better understand how those events impact the near-earth space environment. Continue to explore fundamental radio frequency and chemical interactions in the near-earth space environment to inform potential utility for military applications. Continue work on hybrid supersonic solver code development and validation with emphasis on developing an end-to-end modeling Suite for re-entry systems. Initiate development of capabilities using environmental interactions such as radio frequency interference, material aging, and plume luminescence to enable coupled local and enterprise space domain awareness. Initiate integration with local multi-agent autonomous threat sensing and characterization to accurately sense and specify the space environmental impacts on military radio-frequency systems. Initiate demonstration of controlled radio-frequency propagation effects across relevant frequency ranges for operations. Initiate improvement in efficiency of plasma generation systems to enable practical applications, and validate plasma cloud formation models and evolution for engineered solutions. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 by $8.710 million. Funding decreased due to less emphasis on historical space environment data gathering.			
Title: Surveillance Technologies	0.000	5.864	8.672
Description: Develop advanced target detection techniques, spectral signature libraries, and decision aids for space-based sensors and surveillance systems. ***FY 2021 Plans:*** Initiate development of capability metrics for new satellite constellation architectures, advanced data analytics, and satellite demonstration concepts. Continue study of advanced surveillance and detection technologies for tracking emerging and evolving targets, including ballistic and non-ballistic targets that pose new challenges for missile warning systems. Document findings of innovative computational methods for missile warning System Program Office to significantly decrease satellite down-link bandwidth while maintaining high fidelity of missile warning data. Document findings of analysis tasks associated with on-orbit experiments that demonstrated advanced sensor and analytic methods of innovative hypertemporal imaging early missile warning concept, including the collection and analysis of missile and missile like data. Continue investigation of on-board processing capabilities and limitations for large datasets. Continue investigation of advanced surveillance and detection technologies for an expanded range of mission applications. ***FY 2022 Plans:*** Complete development of capability metrics for new satellite constellation architectures, advanced data analytics, and satellite demonstration concepts. Continue development of advanced surveillance and detection technologies, including innovative data analytics and sensor concepts, to track targets that pose new challenges for missile warning systems and an expanded range of tactical threat warning systems. Complete study and transition findings for decreasing satellite bandwidth for down-link of missile warning data to Missile Warning System Program Office. Transition findings of hyper-temporal imaging demonstration of new			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 621010 / *Space Survivability & Surveillance*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
early missile warning concept to Missile Warning System Program Office and Other Government Agencies. Continue development of automated data analytics for data processing on-board satellites, and initiate development for cloud platforms, to meet tactical mission timelines. Continue study of tactical surveillance technologies for target detection by autonomous sensing grids operating across multiple-domains. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $2.808 million. Funding increased due to an increased emphasis on space-based tactical ISR technology development.			
Title: Radiation Remediation Research ***Description:*** Conduct Radiation Belt Remediation research through development and validation of analytical performance models for remediation of Earth radiation belts following high altitude nuclear detonation. ***FY 2021 Plans:*** Test new algorithms on high performance computing capabilities with special focus on improving earth structure models and the resulting automation of the discrimination of seismic events. Exercise earth models in use in high-performance computing modeling and simulation codes for operational expert analysis of difficult-to-discriminate earthquakes and explosions. Continue to test specific algorithms for application of big data heuristics to more quickly characterize seismic events. Further develop new statistical approaches to the behavior of discriminants for local (less than 200 kilometers) and regional (less than 2,000 kilometers) seismic events. ***FY 2022 Plans:*** Not applicable ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 by $1.744 million. Funding decreased due to project completion in FY 2021.	0.000	1.744	0.000
Title: Seismic Technologies ***Description:*** Develop seismic technologies to support national requirements for monitoring nuclear explosions with special focus on regional distances less than 2,000 kilometers from the sensors. ***FY 2021 Plans:*** Test new algorithms on high performance computing capabilities with special focus on improving earth structure models and the resulting automation of the discrimination of seismic events. Exercise earth models in use in high-performance computing modeling and simulation codes for operational expert analysis of difficult-to-discriminate earthquakes and explosions. Continue to test specific algorithms for application of big data heuristics to more quickly characterize seismic events. Further develop new	0.000	5.660	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 621010 / *Space Survivability & Surveillance*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
statistical approaches to the behavior of discriminants for local (less than 200 kilometers) and regional (less than 2,000 kilometers) seismic events. ***FY 2022 Plans:*** Not applicable ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 by $5.660 million. Funding decreased due to the transfer and realignment of the work in the Seismic Technologies effort in PE 1206601SF, Space Technology, Project 621010, Space Survivability & Surveillance, to Appropriation 3600, Research, Development, Test & Evaluation, Air Force, PE 0602201F, Aerospace Vehicles Technologies, Project 625172, Nuclear System Technology due to the creation of a new Appropriation for Space Force.			
Title: Alternative Navigation Technologies ***Description:*** Develop new technologies based on cold atom physics and photonics that provide autonomous jam-proof precision inertial navigation to augment Global Positioning System in case of Global Positioning System-denial. Develop atomic clocks and methods to disseminate time based on new technologies to replace legacy Global Positioning System atomic clocks and networks. ***FY 2021 Plans:*** Complete rad-hard component development for advanced compact atomic clocks with improved accuracy and stability to replace legacy atomic clocks. Deliver system for integration onto experimental satellite system. Continue transition of advanced atomic clocks to industry with potential on ramp onto future satellites. Continue testing of cold atom 3-axis accelerometers for improved Internal Navigation Systems in Global Position System denied environments. ***FY 2022 Plans:*** Complete transition of advanced atomic clocks to industry. Continue testing of cold atom 3-axis accelerometers for improved Internal Navigation Systems in Global Position System-denied environments. Initiate development of advanced photonic systems for high-performance time transfer. Initiate development of advanced components for quantum systems such as very low noise amplifiers, power efficient narrow-bandwidth lasers, and optical frequency comb technology. Initiate development of quantum timing systems for advanced communication applications. Initiate demonstration of 3-axis accelerometer outside of laboratory environment. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $11.155 million. Funding increased due to increase in emphasis of non-traditional, next-generation positioning, navigation, timing, and communications technologies.	0.000	8.304	19.459
Accomplishments/Planned Programs Subtotals	0.000	41.807	39.656

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 621010 / *Space Survivability & Surveillance*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / *Space Technology*	Project (Number/Name) 624846 / *Spacecraft Payload Technologies*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
624846: *Spacecraft Payload Technologies*	-	0.000	29.796	31.150	0.000	31.150	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This project develops advanced technologies that enhance spacecraft payload operations by improving component and subsystem capabilities. The project focuses on development of advanced, space-qualified, survivable electronics, and electronics packaging technologies; development of advanced space data generation and exploitation technologies, including infrared sensors; and development of high-fidelity space simulation models that support space-based surveillance and space asset protection research and development for the warfighter.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space-Based Detector Technologies	0.000	6.149	6.600
Description: Develop advanced infrared device technologies that enable hardened space detector arrays with improved detection to perform acquisition, tracking, and discrimination of space objects and missile warning. ***FY 2021 Plans:*** Begin design, development, and assessment of low-cost, high-volume infrared detectors and focal plane arrays for proliferated space architecture layers. Begin development of focal plane array optical data outputs for higher speed and data throughput and begin radiation tolerance characterization of photonic devices. Begin development of alternative infrared focal plane array materials and device architectures. Continue development of resilient scanning and staring digital focal plane arrays. Complete development of 8192 x 8192 pixels, 10 micron pixel pitch focal plane arrays hardened to the natural space environment and focused photons to enable whole-earth staring for Launch Detection and Missile Warning missions. ***FY 2022 Plans:*** Continue design, development, and assessment of low-cost, high-volume infrared detectors and focal plane arrays for proliferated space architecture layers. Continue development of focal plane array optical data outputs for higher speed and data throughput and continue radiation tolerance characterization of photonic devices. Continue development of alternative infrared focal plane array materials and device architectures. Complete development of resilient scanning and staring digital focal plane arrays. Initiate development and assessment of event based sensing concepts and hardware. Initiate development of high dynamic range, laser hardened 8192 x 8192 pixels, 10 micron pixel pitch focal plane arrays. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $0.451 million. Justification for this increase is described in plans above.			
Title: Space Elecronics Research	0.000	6.928	4.879

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 624846 / *Spacecraft Payload Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Develop technologies for space-based payload components such as radiation-hardened electronic devices, microelectro-mechanical system devices, and advanced electronics packaging. ***FY 2021 Plans:*** Continue leadership role in Deputy Assistant Secretary of Defense Systems Engineering trusted and assured microelectronics strategy efforts by development of trusted manufacturing techniques that reduce risk to National Security Space systems. Improving benchmarking capabilities on state-of-the-art electronics using latest spacecraft algorithms and transitioning results to acquisition community to enable data-informed payload architecture design decisions. Initiating complete space qualification planning for next generation space processor and begin implementing plan. Continue development of alternative memory approaches for high density memory needed for next-generation space systems. Continue research and development of ultra-low power and neuromorphic/cortical processing architectures to enable game-changing capabilities in future National Security Space systems. Continue advanced transistor research and development, and transitioning techniques to mainstream manufacturing. ***FY 2022 Plans:*** Continue leadership role in Deputy Assistant Secretary of Defense Systems Engineering trusted and assured microelectronics strategy efforts to develop trusted manufacturing techniques that reduce risk to National Security Space systems. Continue adapting bench-marking capabilities on new electronics using the latest spacecraft algorithms and transitioning bench-marking capabilities and results to the acquisition community to enable data-informed payload architecture design decisions. Complete space qualification planning for next generation space processor. Complete development of alternative memory approaches. Continue research and development of ultra-low power and neuromorphic/cortical processing architectures and advanced transistor research to enable game-changing capabilities in future National Security Space systems. Initiate small satellite, high-performance processing to enable on-orbit autonomy, data fusion, and machine learning. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 by $2.049 million. Funding decreased due to less emphasis on large satellite, high performance, long life computer processing capability development.			
Title: Modeling and Simulation Tools for Space Applications ***Description:*** Provide modeling, simulation, and analysis for technology evolution in space-based terrestrial surveillance systems, precision navigation and timing, space domain awareness, satellite communications, space environment monitoring, and space control payloads. ***FY 2021 Plans:***	0.000	8.789	5.929

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 624846 / *Spacecraft Payload Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Complete mission-level military utility analyses of architecture approaches across multi-domain mission areas. Continue refining guidelines and checkpoints for concept maturation evaluations in context of emerging space technologies. Continue development of models and mission simulations of the National Space Defense Center's new space and space enterprise capabilities. ***FY 2022 Plans:*** Initiate next generation mission-level military utility analyses of technology and associated architectures and employment concepts across multi-domain mission applications. Continue refining guidelines and checkpoints for concept maturation evaluations in context of emerging space technologies. Complete development of models and mission simulations of the National Space Defense Center's capabilities. Initiate model-based systems engineering into technology decision-making and flight experiment design. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 by $2.860 million. Funding decreased due to change in emphasis from architecture-level utility analysis to more technology-level utility analysis.			
Title: Alternative Positioning, Navigation, and Timing Technology	0.000	7.930	13.742
Description: Identify and develop technologies that enable new, or enhance existing, United States positioning, navigation, and timing satellite capabilities by increasing resiliency and availability of accuracy, and/or increasing the affordability of providing current capabilities. Develop technologies to meet identified Air Force Space Command/Space and Missile Systems Center positioning, navigation, and timing space payload technology needs. ***FY 2021 Plans:*** Develop advanced Precision Navigation and Timing waveforms and begin to examine the interaction of signals between the space, ground, and user equipment segments. Explore new technologies for positioning, navigation, and timing payloads that will improve performance and affordability. Continue studies that explore technologies for multi-layer space-based positioning, navigation, and timing architecture in order to improve resiliency of the space architecture. Work to develop modeling and simulation results of next generation space architecture and the impact of developing technologies. ***FY 2022 Plans:*** Complete transition of advanced precision navigation, and timing waveforms via publication of interface control document and continue to examine the interaction of signals between the space, ground, and user equipment segments. Continue development of new technologies for positioning, navigation, and timing payloads that will improve performance and affordability. Continue development of technologies for multi-layer space-based positioning, navigation, and timing architecture in order to improve resiliency of the space architecture and reduce burden on the user. Continue development of modeling and simulations of next			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 624846 / *Spacecraft Payload Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
generation space architecture and the impact of developing technologies. Initiate laboratory and field testing capabilities of new signals and architecture concepts. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $5.812 million. Funding increased due to increased emphasis in next-generation positioning, navigation, and timing technologies for space-based architectures.			
Accomplishments/Planned Programs Subtotals	0.000	29.796	31.150

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / *Space Technology*	Project (Number/Name) 624847 / *Rocket Propulsion Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
624847: *Rocket Propulsion Technology*	-	0.000	0.000	15.046	0.000	15.046	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This project develops rocket propulsion technologies for space access and space maneuver. Analytical and experimental areas of emphasis are propellants, propellant management, combustion, rocket material applications, and innovative space propulsion concepts. Technologies of interest will improve reliability, performance, survivability, affordability, and environmental compatibility of these systems. Develop technologies to reduce the weight and cost of components using new materials and improved designs and manufacturing techniques. All efforts in this project contribute to the sustainment of the space and rocket propulsion industry, providing rocket propulsion technology for the entire Department of Defense (DoD). Technologies under this project enable capabilities of interest to both DoD and National Aeronautics and Space Administration (NASA). Tasks include: modeling and simulation; proof of concept tests of critical components; advanced component development; and ground-based tests. All thrusts are part of the Rocket Propulsion 21 (RP21) collaboration and are reviewed by a DoD level steering committee yearly for relevance to DoD missions and progress towards RP21 Goals.

In FY 2022, the liquid engine combustion technologies, advanced liquid engine technologies, and on-orbit propulsion technologies efforts of PE 0602203F, Aerospace Propulsion, Project 624847, Rocket Propulsion Technology were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, Project 624847, Rocket Propulsion Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Liquid Engine Combustion Technologies	0.000	0.000	7.082
Description: Develop advanced liquid engine combustion technology for improved performance, while preserving chamber lifetime and reliability needs for engine uses in heavy lift space vehicles. ***FY 2021 Plans:*** Not applicable ***FY 2022 Plans:*** Complete evaluation of methane multi-injector designs in hot-fire conditions. Complete hot fire tests in combustion stability rig. Complete combustion stability modeling critical for future hydrocarbon fueled liquid rocket engines. Complete developing understanding of hydrocarbon fuel production, expanding testing into methane fuels and other cryogenic cooling. Continue the employment of new fuel and material operating limitations, manufacturing processes, and launch goals in cycle analysis to identify trade space for future engines. Continue to develop and evaluate advanced material solutions for high temperature components in rocket propulsion. Continue installation of new test facility that will fill the current capability gap and allow for fast, low-cost testing of multi-injector designs and stability strategies at conditions relevant to the demands of both Department of Defense and			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 624847 / *Rocket Propulsion Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
industry for next-generation engines (including use of liquid oxygen and higher pressures and thrust). Continue development and payoff determination of rotating detonation rocket engine technologies. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $7.082 million. Funding increased due to the transfer and realignment of the work in the Liquid Engine Combustion Technologies effort in PE 0602203F, Aerospace Propulsion, Project 624847, Rocket Propulsion Technology, to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, Project 624847, Rocket Propulsion Technology due to the creation of a new Appropriation for Space Force.			
Title: Advanced Liquid Engine Technologies ***Description:*** Develop advanced liquid engine technologies for improved performance, while increasing life and reliability needs for engine uses in expendable and reusable launch vehicles. ***FY 2021 Plans:*** Not applicable ***FY 2022 Plans:*** Continue sub-scale risk mitigation and technology maturation activities to incorporate into next generation engine concepts. Continue modular component integration and interaction research activities supporting next generation engine concepts. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $3.134 million. Funding increased due to the transfer and realignment of the work in the Advanced Liquid Engine Technologies effort in PE 0602203F, Aerospace Propulsion, Project 624847, Rocket Propulsion Technology, to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, Project 624847, Rocket Propulsion Technology due to the creation of a new Appropriation for Space Force.	0.000	0.000	3.134
Title: On-Orbit Propulsion Technologies ***Description:*** Develop solar electric, solar thermal, chemical, and advanced propulsion technologies for station-keeping, repositioning, and orbit transfer for satellites and satellite constellations. ***FY 2021 Plans:*** Not applicable ***FY 2022 Plans:*** Continue advanced chemical propellants development focusing on flight-weight systems to assist in transition to industry partners. Continue to support the maturation of advanced diagnostics for both chemical and electric propulsion thruster plumes with potential for integrated state-of-health application. Continue to expand the validation and verification programs (both experimental and flight) to quantify accuracy of modeling and simulation tools developed to support thruster-spacecraft integration. Continue	0.000	0.000	4.830

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 624847 / *Rocket Propulsion Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
transition and support of thruster/ plume modeling framework to spacecraft industry to propulsion community. Continue expanding exploration of advanced integrated electric propulsion and chemical thruster concepts and assess new spacecraft propulsion requirements. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $4.830 million. Funding increased due to the transfer and realignment of the work in the On-Orbit Propulsion Technologies effort in PE 0602203F, Aerospace Propulsion, Project 624847, Rocket Propulsion Technology, to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, Project 624847, Rocket Propulsion Technology due to the creation of a new Appropriation for Space Force.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	15.046

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / *Space Technology*	Project (Number/Name) 624866 / *Lasers & Imaging Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
624866: *Lasers & Imaging Technology*	-	0.000	0.000	16.824	0.000	16.824	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This project conducts research supporting ground-based optical space domain awareness.

In FY 2022, the optical space domain awareness and satellite vulnerability efforts of PE 0602605F, Directed Energy Technology, Project 624866, Lasers & Imagining Technology were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, Project 624866, Lasers & Imaging Technology, from Appropriation 3600, Budget Activity (BA) 02 due to the creation of a new Appropriation for Space Force.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Optical Space Situational Awareness and Satellite Vulnerability	0.000	0.000	16.824

Description: Develop advanced, long-range, electro-optical technologies that enable ground-based optical Space Domain Awareness (SDA) and quantum-based optical communications. Develop and use technologies to understand the vulnerability of blue satellite systems and components to lasers. Operate the Starfire Optical Range (SOR) to conduct research meeting internal and customer requirements.

FY 2021 Plans:

Not applicable

FY 2022 Plans:

Continue to mature daylight detection of satellites allowing custody through daytime hours when satellites cannot normally be detected by ground-based optical systems. Continue to mature component technologies for 24/7 real-time optical imaging of near-earth and geosynchronous objects enabling characterization on tactical timelines. Continue investigation through modeling and simulation the susceptibility of satellite components to laser threats to inform practical designs for protection equipment and for tactically-rapid course-of-action decision-making enabling protection methods. Continue research & development of laser-enabled space domain awareness (SDA) focused on full-dark imaging using laser illumination. Continue development of laser-enabled options for both ranging to and imaging of geosynchronous satellites from apertures smaller than 3 meters. Continue development of long-range secure optical communications technologies leveraging quantum science for free space lasercom channels. Continue project to apply machine-learning to automatically identify geosynchronous-orbit objects more accurately and rapidly than current "hard-wired" algorithms can. Continue to maintain the Starfire Optical Range (SOR) facilities and experimental equipment in a mission-ready state.

FY 2021 to FY 2022 Increase/Decrease Statement:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 624866 / *Lasers & Imaging Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2022 increased compared to FY 2021 by $16.824 million. Funding increased due to the transfer and realignment of the work in the Optical Space Situational Awareness and Satellite Vulnerability effort in PE 0602605F, Directed Energy Technology, Project 624866, Lasers & Imaging Technology, to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206601SF, Space Technology, Project 624866, Lasers & Imaging Technology due to the creation of a new Appropriation for Space Force.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	16.824

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / *Space Technology*	Project (Number/Name) 625018 / *Spacecraft Protection Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
625018: *Spacecraft Protection Technology*	-	0.000	11.639	12.427	0.000	12.427	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This project develops the technologies for protecting United States space assets in potentially hostile environments to assure continued space system operation without performance loss in support of warfighter requirements. The project focuses on identifying and assessing spacecraft system vulnerabilities, developing threat warning technologies, and development of technologies to mitigate the effects of both intentional and unintentional threats.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Threat Warning Research	0.000	11.639	12.427

Description: Develop satellite threat warning technologies and tools for space defense with an emphasis on new orbital regimes such as cislunar, speed-of-light threats such as cyber, and many-on-many engagement.

FY 2021 Plans:

Continue to develop techniques to detect, track, identify, and characterize satellites using multi-phenomenology to address gaps in knowledge for space situational awareness and consider the tasking, collection, processing, exploitation and dissemination needs. Assess timeliness and persistence of space situational awareness capability and develop techniques to mitigate the growing population of objects that need to be monitored, from newly launched objects to debris. Conduct cooperative development utilizing commercial and international space situational awareness sources. Initiate research and development on an integrated ground and space indications and warnings experiment. Utilize space resiliency testbed to integrate technology solutions, and evaluate effectiveness against notional threats to our space architectures. Develop cyber hardening technologies, and integrate space and cyber operations capabilities. Conduct end-to-end evaluations and hardware-in-the-loop experiments for threat warning and response capabilities for protection of high value space assets. Conduct experiments, integrating commercial space C2 capabilities into Department of Defense ground architectures. These capabilities include real-time mission planning, utilization of non-traditional Intel sources (i.e. social media), multi-path communications architectures, etc. Develop and demonstrate autonomous technologies using net-centric space command and control architectures for multi-domain command and control across the full scope of the ground and space-based enterprise. Continue development and demonstration of advanced algorithms for sensor data fusion and satellite threat detection, assessment, and response. Investigate, implement, and demonstrate integrated command and control systems at the tactical, operational, and strategic levels. Continue assessment and development of commercial capability in order to either augment or replace traditional methods for space related command and control. Continue engagements with commercial space data providers for testing new enabling technologies on commercial satellites. Continue to develop on-board autonomous satellite technologies and plan for next generation flight experiments.

FY 2022 Plans:

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 625018 / *Spacecraft Protection Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue to develop techniques to detect, track, identify, and characterize satellites using multi-phenomenology techniques with an emphasis on space domain awareness beyond geosynchronous equatorial orbit all the way to the moon. Assessment includes sensors, data integration, and operator tools, to include government, commercial, and allies. Complete research and development on an integrated ground and space indications and warnings experiment. Continue development of on-orbit threat warning sensing and assessment with emphasis on spectrum awareness and inherent, on-board satellite sensors. Continue research on cyber hardening of space assets with laboratory testbeds transitioning regularly to on-orbit experimentation. Continue experimentation and exercises with Department of Defense ground architectures, operations centers, and commercial and international partners. Complete demonstration of advanced sensor data fusion algorithms. Continue engagements with commercial space data providers for testing new enabling technologies on commercial satellites. Continue to develop on-board autonomous satellite technologies and plan for next generation flight experiments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $0.788 million. Justification for this increase is described in plans above.			
Accomplishments/Planned Programs Subtotals	0.000	11.639	12.427

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 2	R-1 Program Element (Number/Name) PE 1206601SF / *Space Technology*	Project (Number/Name) 628809 / *Spacecraft Vehicle Technologies*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
628809: *Spacecraft Vehicle Technologies*	-	0.000	133.632	60.693	0.000	60.693	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This project focuses on spacecraft platforms (for example: structures, power, and thermal management); satellite control (signal processing and control); and space experiments of maturing technologies for space qualification.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Power/Thermal Research	0.000	4.458	6.472
Description: Develop technologies for advanced space platform subsystems such as compact, high efficiency solar power cells and arrays, and innovative power generation concepts. ***FY 2021 Plans:*** Continue research into advanced space solar cells, solar array, and energy storage technologies. Focus on support for current heritage space systems, while also pivoting towards support of smaller space vehicles that will be utilized for the Space Warfighting Construct. Solar cells with end of life performance, which depends on the mission, above 28% power conversion efficiency. Solar array structures tailored for small to large missions with specific power greater than 100 watts per kilogram. Energy storage chemistries with cell-level specific energy greater than 300 watt-hours per kilogram. Further development of array hardening approaches to provide drop-in replacement panels. ***FY 2022 Plans:*** Continue developing high power arrays and storage capability for small satellites including solar array structures tailored for small missions but scalable to all missions with specific power greater than 100 watts per kilogram. Complete transition of technologies developed for advanced space solar cells, solar array, and energy storage for current heritage space systems, to include solar cells with end of life performance, which depends on the mission, above 28% power conversion efficiency, energy storage chemistries with cell-level specific energy greater than 300 watt-hours per kilogram, and array hardening approaches to provide drop-in replacement panels. Initiate development of power system sensing and protection capabilities across the applicable threat matrix for proliferated low Earth orbit constellations and next generation US Space Force satellite buses. Initiate exploration of alternative power generation sources beyond solar including nuclear. Initiate research to enable high-pulsed power systems including generation, storage, and heat rejection technologies for small satellites. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $2.014 million. Funding increased due to increased emphasis on power system sensing and protection capabilities and alternative space power generation.			
Title: Space Structures and Controls Research	0.000	11.540	13.065

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 628809 / *Spacecraft Vehicle Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Develop revolutionary and enabling technologies, including lighter weight, lower cost, high performance structures for space platforms; guidance, navigation, and controls hardware and software for next generation of space superiority systems. ***FY 2021 Plans:*** Continue reactive maneuver strategies for spacecraft resiliency in hardware-in-the-loop testbeds. Initiate on-orbit experiment planning for reactive maneuver strategies. Apply research in verification and validation techniques for autonomous spacecraft flight software to high-fidelity simulations and brassboard laboratory experiments. Apply improved estimation algorithms for on-orbit navigation software to experimental data to assess performance and robustness. Complete laboratory and high-fidelity simulations/breadboard implementation for navigation algorithms and assess progress towards flight experiment demonstration. Continue development of integrated proof-of-concept experiments for advanced, agile manufacturing and assembly technologies for satellite production to improve performance and affordability. Continue research in functionalized structures using multimaterial additive manufacturing. Transition development of research efforts in high-power small satellite technologies and affordable, high-performance phased arrays and electrically steerable antennas for tactical communication and radar concepts for agile, intelligent targets to advanced development and flight experimentation. ***FY 2022 Plans:*** Complete transition of reactive maneuver strategies for spacecraft resiliency for hardware-in-the-loop testbeds, on-orbit navigation estimation algorithms for traditional orbits, and on-orbit experiment planning for reactive maneuver strategies. Continue research in autonomous spacecraft flight software including verification and validation and techniques for high-fidelity simulations. Complete transition efforts in agile manufacturing, additive manufacturing, and high-performance phased arrays and antennas. Initiate research to enable space logistics concepts including autonomous rendezvous, proximity operations, and docking; refueling and module upgrade; and on-orbit assembly. Initiate research to develop guidance and navigation algorithms for cislunar space including novel orbits. Initiate research efforts in high-performance, resilient small satellite technologies and development efforts in deployable structures, metrology, power and thermal management for tactical intelligence, surveillance, and reconnaissance missions in contested environments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $1.525 million. Funding increased due to increased emphasis in high-performance, resilient small satellite development and guidance and control necessary for cis-lunar orbits.			
Title: Space Experiments ***Description:*** Develop flight experiments to improve the capabilities of existing operational space systems and to enable new transformational space capabilities. ***FY 2021 Plans:***	0.000	24.952	27.532

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 628809 / *Spacecraft Vehicle Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Conduct on-orbit small satellite demonstration of the first ever Link-16 from space to the tactical user enabling a Common Operating Picture for the Warfighter in a contested/degraded environment in support of Multi-Domain Command and Control. On-orbit small satellite demonstration capable of measuring radiation in the inner magnetosphere giving insight into the particle radiation space environment. Conduct a flight selection process and perform trade studies to determine the next flight experiment(s). Develop and mature a reference design, technical objectives, and experiment plan in coordination with Air Force Space Command, Space and Missile Systems Center and/or other mission partners. Begin working long lead items such as contracting strategy, parts, frequency allocation, and information assurance strategies. ***FY 2022 Plans:*** Complete on-orbit demonstration of Link-16 experiment from space and transition mission data experimental findings to Space Development Agency for future architecture proliferation. Complete on-orbit small satellite demonstration capable of measuring radiation in the inner magnetosphere giving insight into the particle radiation space environment. Continue requirements development and preliminary concept feasibility and preliminary designs of follow-on space experiments in areas that include autonomy, cyber security, and development of small satellite sub-systems to improve performance and military utility. Continue working long lead items such as contracting strategy, parts, frequency allocation, and information assurance strategies. Initiate development and on-orbit experiment of a space-to-air/ground mesh-network concept. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $2.580 million. Funding increased due to emphasis on technology development for highly capable small satellites for proliferated LEO applications.			
Title: Space Communication Technologies	0.000	6.682	13.624
Description: Develop technologies for next-generation space communications terminals and equipment and methods/techniques to enable future space system operational command and control concepts. ***FY 2021 Plans:*** Support W/V-band payload operations, telemetry analysis, and health and status monitoring. Conduct development and technology demonstrations to address future military satellite communications capability and technology needs, for example, high-gain antenna, high-power amplifiers, low-noise amplifiers, cognitive / resilient networks, reconfigurable satellite radios / transponders, and anti-jam signal processing technologies. Support development and demonstration of novel laser communications technologies such as multi-wave length optical routers. Develop network traffic models, multi-spacecraft network models, and spacecraft network simulation support, along with analysis/visualization tools. ***FY 2022 Plans:*** Continue to support W/V-band payload operations, telemetry analysis, and health and status monitoring. Initiate deployment of laser communications onto V/W-band test set-ups to show synergy between terminals. Complete development of technology demonstrations to address future military satellite communications capability and technology needs, for example, high-gain			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 628809 / *Spacecraft Vehicle Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
antenna, high-power amplifiers, low-noise amplifiers, cognitive / resilient networks, reconfigurable satellite radios / transponders, and anti-jam signal processing technologies. Complete development and demonstration of novel laser communications technologies such as multi-wave length optical routers. Initiate development of router that supports multi-spacecraft network and network traffic. Initiate developing methods for multi-access laser communications, reconfigurable laser communications, and positioning, navigation, and timing over laser communication links. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $6.942 million. Funding increased due to incorporation of laser crosslink communication technologies on W/V-band satellite demonstration.			
Accomplishments/Planned Programs Subtotals	0.000	47.632	60.693

	FY 2020	FY 2021
Congressional Add: Congressional Add: Program increase - operational cryogenic upper stage augmentation Kit ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressional directed effort.	0.000	7.000
Congressional Add: Congressional Add: Program increase - thin-film photovoltaic energy ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort.	0.000	7.000
Congressional Add: Congressional Add: Program increase - hybrid space architecture ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort.	0.000	10.000
Congressional Add: Congressional Add: Program increase - resilient solar power ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort.	0.000	3.000
Congressional Add: Congressional Add: Program increase - ultra-lightweight solar arrays ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort.	0.000	15.000
Congressional Add: Congressional Add: Program increase - link-16 space experiment	0.000	9.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 2	**R-1 Program Element (Number/Name)** PE 1206601SF / *Space Technology*	**Project (Number/Name)** 628809 / *Spacecraft Vehicle Technologies*

	FY 2020	FY 2021
FY 2020 Accomplishments: Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort.		
Congressional Add: Congressional Add: Program increase - advanced space power systems ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort.	0.000	7.000
Congressional Add: Congressional Add: Program increase - digital engineering for future space systems ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort. This effort will be executed in PE 1206601SF, Space Technology, Project 625018, Spacecraft Protection Technology.	0.000	5.000
Congressional Add: Congressional Add: Program increase - laser communications ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort. This effort will be executed in PE 1206601SF, Space Technology, Project 624846, Spacecraft Payload Technologies.	0.000	12.000
Congressional Add: Congressional Add: Program increase - lithium-sulfur battery development ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort.	0.000	5.000
Congressional Add: Congressional Add: Program increase - small satellite mission control facility ***FY 2020 Accomplishments:*** Not applicable. ***FY 2021 Plans:*** Conduct Congressionally directed effort.	0.000	6.000
Congressional Adds Subtotals	0.000	86.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 1206616SF *I Space Advanced Technology Development/Demo*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	76.653	0.000	76.653	-	-	-	-	-	-
633834: *Integrated Space Technology Demonstrations*	-	0.000	0.000	36.871	0.000	36.871	-	-	-	-	-	-
634868: *Maui Space Surveillance System*	-	0.000	0.000	12.162	0.000	12.162	-	-	-	-	-	-
634922: *Space & Missile Rocket Propulsion*	-	0.000	0.000	16.214	0.000	16.214	-	-	-	-	-	-
63682J: *Spacecraft Vehicles*	-	0.000	0.000	11.406	0.000	11.406	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This program focuses on four major areas. First, integrated space technology demonstrations, is a series of advanced technology demonstrations designed to address mission needs by applying emerging technologies from the Air Force Research Laboratory, other United States government laboratories, and industry. Second, the program focuses on ground-based optical space situational awareness technology development and demonstration at the Maui Space Surveillance System in Hawaii, as well as the operation and upgrade of the facility. Third, the program develops and demonstrates advanced and innovative low-cost high performance satellite propulsion technologies and components. The last major area, spacecraft vehicles, focuses on developing technologies for next-generation space communications terminals and equipment. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

In FY 2022, PE 0603401F, Advanced Spacecraft Technology, Project 633834, Integrated Space Technology Demonstrations efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 633834, Integrated Space Technology Demonstrations, from Appropriation 3600, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

In FY 2022, PE 0603444F, Maui Space Surveillance System, Project 634868, Maui Space Surveillance System efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 634868, Maui Space Surveillance System, from Appropriation 3600, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

In FY 2022, the liquid rocket propulsion technologies and on-orbit propulsion technologies efforts of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634922, Space & Missile Rocket Propulsion were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 634922, Space & Missile Rocket Propulsion, from Appropriation 3600, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 1206616SF *I Space Advanced Technology Development/Demo*

In FY 2022, the space communications technologies efforts of PE 0603401F, Advanced Spacecraft Technology, Project 63682J, Spacecraft Vehicles were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 63682J, Spacecraft Vehicles, from Appropriation 3600, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science and technology capabilities. The use of program funds in this PE would be in addition to civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 060220F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 0606698F, and 1206601SF.

The Department of the Air Force technologies in this program are both enabling and enduring as we invest in maturing emerging technologies that address established mission gaps, and transformational technologies that address integrated enterprise capabilities intended to reshape the future force across air, space, and cyber warfighting domains. Development of transformational operational capabilities through advanced technology solutions focuses on five strategic capabilities: Global Persistent Awareness; Resilient Information Sharing; Rapid, Effective Decision-Making; Complexity, Unpredictability, and Mass; and Speed and Reach of Disruption and Lethality.

This program is in Budget Activity 3, Advanced Technology Development because this budget activity includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	76.653	0.000	76.653
Total Adjustments	0.000	0.000	76.653	0.000	76.653
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	76.653	0.000	76.653

Change Summary Explanation

Increase in FY 2022 due to efforts of PE 0603401F, Advanced Spacecraft Technology, Project 633834, Integrated Space Technology Demonstrations, PE 0603444F, Maui Space Surveillance System, Project 634868, Maui Space Surveillance System, PE 0603216F, Aerospace Propulsion and Power Technology, Project 634922, Space & Missile Rocket Propulsion, and PE 0603401F, Advanced Spacecraft Technology, Project 63682J, Spacecraft Vehicles, being transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, from Appropriation 3600, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 3	R-1 Program Element (Number/Name) PE 1206616SF / *Space Advanced Technology Development/Demo*	Project (Number/Name) 633834 / *Integrated Space Technology Demonstrations*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
633834: *Integrated Space Technology Demonstrations*	-	0.000	0.000	36.871	0.000	36.871	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project is a series of advanced technology demonstrations designed to address mission needs by applying emerging technologies from the Air Force Research Laboratory, other United States government laboratories, and industry. These technologies are integrated into system-level demonstrations that are used to test, evaluate, and validate the technologies in a relevant environment.

In FY 2022, PE 0603401F, Advanced Spacecraft Technology Development/Demo, Project 633834, Integrated Space Technology Demonstrations efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development, Project 633834, Integrated Space Technology Demonstrations, from Appropriation 3600, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Integrated Satellite Demonstrations	0.000	0.000	28.476
Description: Develop satellite technologies for integrated, robust, and flexible satellite demonstrations building on previous work and leveraging investments by other organizations.			
FY 2021 Plans: Not applicable			
FY 2022 Plans: Continue to transition formation flying satellites using near autonomous formation control. Complete coordination of manifest timeline for critical space science and technology projects addressing priority US Space Force requirements. Continue to transition hosted secondary satellite system used to quickly fly demonstrations and prototypes. Complete payload maturation and begin fabrication of satellites to operate in Very Low Earth Orbit to examine upper atmosphere ionization processes impacting the propagation of radio frequencies used for warfighter communications and navigation. Initiate the development of satellites for flight beyond the geostationary environment to demonstrate technology required for space domain awareness in cislunar space and the			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 633834 / *Integrated Space Technology Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
requisite support elements, including communication links, position and timing accuracy, and autonomy, to operate in that orbital regime. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $28.476 million. Funding increased due to the transfer and realignment of the work in the Integrated Satellite Demonstrations effort in PE 0603401F, Advanced Space Technology, Project 633834, Integrated Space Technology Demonstrations, to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 633834, Integrated Space Technology Demonstrations due to the creation of a new Appropriation for Space Force.			
Title: Transformational Technology Development ***Description:*** Continually funded effort. This funding allocation will start new and continue Transformational Technology Developments. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming; Battlespace Awareness; Integrated Base Defense; and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to: cislunar space domain awareness and space logistics. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made. ***FY 2022 Plans:*** Fund the follow-on efforts for projects started in FY 2021. Select Transformational Technology Development efforts in FY 2022 that support the National Defense Strategy and Department of the Air Force priorities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $8.395 million. Funding is increased due to the creation of a new Appropriation for Space Force.	-	-	8.395
Accomplishments/Planned Programs Subtotals	0.000	0.000	36.871

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 3	R-1 Program Element (Number/Name) PE 1206616SF / *Space Advanced Technology Development/Demo*	Project (Number/Name) 634868 / *Maui Space Surveillance System*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
634868: *Maui Space Surveillance System*	-	0.000	0.000	12.162	0.000	12.162	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program funds ground-based optical space situational awareness technology development and demonstration at the Maui Space Surveillance System in Hawaii, as well as the operation and upgrade of the facility. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

In FY 2022, PE 0603444F, Maui Space Surveillance System, Project 634868, Maui Space Surveillance System efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 634868, Maui Space Surveillance System, from Appropriation 3600, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Operate and Upgrade Maui Space Surveillance System	0.000	0.000	12.162
Description: Operate and upgrade the Maui Space Surveillance System to support development, demonstration, and integration of ground-based optical space domain awareness technologies. ***FY 2021 Plans:*** Not applicable ***FY 2022 Plans:*** Continue to maintain the Maui Space Surveillance System facility and experimental equipment in a mission-ready state, including needed upgrades and modernization to keep facilities and equipment in good working order to perform efficiently and reliably. Continue to operate Maui Space Surveillance System facility for development and demonstration of ground based optical space domain awareness capabilities in conjunction with customer programs and contribute to the Space Domain Awareness mission. Continue to collect observations of satellites as requested by mission partners. Complete transition of dynamic telescope system wide-area-search capability into Maui Space Surveillance System. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $12.162 million. Funding increased due to the transfer and realignment of the work in the Operate and Upgrade Maui Space Surveillance System effort in PE 0603444F, Maui Space Surveillance System, Project 634868, Maui Space Surveillance System, to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 634868 / *Maui Space Surveillance System*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
1206616SF, Space Advanced Technology Development/Demo, Project 634868, Maui Space Surveillance System due to the creation of a new Appropriation for Space Force.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	12.162

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 3	R-1 Program Element (Number/Name) PE 1206616SF / *Space Advanced Technology Development/Demo*	Project (Number/Name) 634922 / *Space & Missile Rocket Propulsion*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
634922: *Space & Missile Rocket Propulsion*	-	0.000	0.000	16.214	0.000	16.214	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops and demonstrates advanced and innovative low-cost rocket turbo-machinery and components, and low-cost space launch propulsion technologies. Characteristics such as environmental acceptability, affordability, reliability, responsiveness, reduced weight, and reduced operation and launch costs are emphasized. Increased life and performance of propulsion systems are key goals. Technology areas investigated include ground demonstrations of compact, lightweight, advanced propulsion technologies, higher efficiency energy conversion systems (derived from an improved understanding of combustion fundamentals), and high-energy propellants. Technological advances in this project could improve the performance of expendable payload capabilities by approximately twenty to fifty percent and reduce launch, operations, and support costs by approximately thirty percent. Responsiveness and operability of propulsion systems will be enhanced for reusable launch systems. The efforts in this project contribute to the sustainment of the rocket propulsion industry, providing rocket propulsion technology for the entire Department of Defense (DoD) and National Aeronautics and Space Administration (NASA). The efforts in this project are part of the Rocket Propulsion of the 21st Century (RP21) program. The efforts in this project are reviewed by a DoD level steering committee annually for relevance to DoD missions and achievement of technical goals defined by the RP21 program.

In FY 2022, the liquid rocket propulsion technologies and on-orbit propulsion technologies efforts of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634922, Space & Missile Rocket Propulsion were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 634922, Space & Missile Rocket Propulsion, from Appropriation 3600, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Liquid Rocket Propulsion Technologies	0.000	0.000	9.247
Description: Develop liquid rocket propulsion technology for current and future space launch vehicles.			
FY 2021 Plans: Not applicable			
FY 2022 Plans: Continue modular engine feasibility to address scalability, applicability, testability, and life cycle cost for National Security Space applications. Initiate development of disruptive engine concepts/cycles for liquid propellant engines, engine system components, and control for space launch system.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 634922 / *Space & Missile Rocket Propulsion*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2022 increased compared to FY 2021 by $9.247 million. Funding increased due to the transfer and realignment of the work in the liquid rocket propulsion technologies effort in PE 0603216F, Aerospace Propulsion and Power Technology, Project 634922, Space & Missile Rocket Propulsion, to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 634922, Space & Missile Rocket Propulsion due to the creation of a new Appropriation for Space Force.			
Title: On-Orbit Propulsion Technologies ***Description:*** Develop solar electric, electric, and monopropellant propulsion technologies for existing and future satellites, upper stages, orbit transfer vehicles, and satellite maneuvering. ***FY 2021 Plans:*** Not applicable ***FY 2022 Plans:*** Continue to develop and transition experimental, modeling and simulation, and theoretical efforts geared towards advanced thruster development with emphasis on understanding thrust scale-up. Complete advancement capabilities to study next generation of hypergolic fuels, including propellant characterization, drop-in testing, and lab-scale thruster demonstration. Continue analysis and development of multi-mode propulsion opportunities to combine high efficiency and high thrust capabilities on a common propellant. Continue thrust scale-up effort for advanced non-toxic for use in monopropellant thrusters and electric propulsion thruster for a multi-mode propulsion capability. Complete electric propulsion thruster effort utilizing advanced non-toxic monopropellant. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $6.967 million. Funding increased due to the transfer and realignment of the work in the on-orbit propulsion technologies effort in PE 0603216F, Aerospace Propulsion and Power Technology, Project 634922, Space & Missile Rocket Propulsion, to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 634922, Space & Missile Rocket Propulsion due to the creation of a new Appropriation for Space Force.	0.000	0.000	6.967
Accomplishments/Planned Programs Subtotals	0.000	0.000	16.214

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 634922 / *Space & Missile Rocket Propulsion*

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 3	R-1 Program Element (Number/Name) PE 1206616SF / *Space Advanced Technology Development/Demo*	Project (Number/Name) 63682J / *Spacecraft Vehicles*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
63682J: *Spacecraft Vehicles*	-	0.000	0.000	11.406	0.000	11.406	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops and demonstrates technologies critical to addressing documented military satellite communications capability gaps and top-ranked Space Force and/or Space and Missile Systems Center technology needs.

In FY 2022, the space communications technologies development efforts of PE 0603401F, Advanced Spacecraft Technology, Project 63682J, Spacecraft Vehicles, were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 63682J, Spacecraft Vehicles, from Appropriation 3600, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Communication Technologies	0.000	0.000	11.406
Description: Develop technologies for next-generation space communications terminals and equipment, along with methods/ techniques to enable future space system operational command and control concepts. ***FY 2021 Plans:*** Not applicable ***FY 2022 Plans:*** Continue support of W/V-band propagation flight experiment. Continue beacon ground terminal operations, maintenance, and re-deployments. Continue collection and analysis of additional data to statistically characterize atmospheric propagation effects and correlate to meteorological parameters. Continue technology research and development work to address military space communications capability needs. Continue fabrication and space-qualify V-band high power amplifiers. Continue development of W/V-band transponder flight experiment, coupled with cross-links. Continue systems engineering and technology risk-reduction for W/V-band ground terminals. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $11.406 million. Funding increased due to the transfer and realignment of the work in the space communication technologies effort in PE 0603401F, Advanced Spacecraft Technology, Project 63682J, Spacecraft Vehicles, to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206616SF, Space Advanced Technology Development/Demo, Project 63682J, Spacecraft Vehicles due to the creation of a new Appropriation for Space Force.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	11.406

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 63682J / *Spacecraft Vehicles*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1203164SF *I NAVSTAR Global Positioning System (User Equipment) (SPACE)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	380.704	434.194	0.000	434.194	-	-	-	-	-	-
643833: *MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP*	0.000	0.000	380.704	434.194	0.000	434.194	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Program MDAP/MAIS Code: 447												

A. Mission Description and Budget Item Justification

The Global Positioning System (GPS) is a space-based radio Positioning, Navigation, and Timing (PNT) distribution system. GPS User Equipment (UE) consists of standardized receivers, antennas, antenna electronics, and other related equipment, grouped together in sets to derive navigation and time information transmitted from GPS satellites. These receiver sets are used by the Department of Defense (DoD). Research, Development, Test and Evaluation (RDT&E) funds UE development, integration, test, and analysis for new PNT receiver capabilities in Navigation Warfare (NAVWAR) across all military platforms using GPS services.

The Military Global Positioning System User Equipment (MGUE) Increment (Inc) 1 program is responsible for the development of standard modernized receiver form factors for the Service-nominated lead platforms. The MGUE Inc 1 Capability Development Document (CDD) was approved by the Joint Requirements Oversight Council (JROC) on 24 July 2014. MGUE Inc 1 is initiating a new family of modernized GPS receivers that will deliver significantly improved capability to counter current and emerging PNT threats and enable military operations in a NAVWAR environment where current legacy receiver performance would be compromised. MGUE Inc 1 received a Milestone A decision in April 2012. The program received direction in February 2014, from the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) to execute a new acquisition strategy, accelerating the program to provide test units faster to facilitate military end users. The MGUE program received a Milestone B decision in January 2017.

The MGUE Inc 2 effort will continue to expand Military-Code (M-Code) receiver technology into additional applications (space receivers and precision guided munitions), and develop a modernized Handheld device to meet Service requirements. This effort leverages the MGUE Inc 1 technology to the maximum extent while addressing the production of M-Code integrated circuits far into the future. The MGUE Inc 2 program is being executed in three parts: 1) Risk Reduction Activities, 2) Miniature Serial Interface (MSI) Receiver Card Middle Tier Acquisition rapid prototyping, and 3) Joint Modernized GPS Handheld Receiver Middle Tier Acquisition rapid prototyping effort. The JROC approved the MGUE Inc 2 CDD on 6 April 2018. The Air Force Service Acquisition Executive approved the MGUE Inc 2 Acquisition Strategy to include designation of two Middle Tier Acquisition Rapid Prototype efforts: 1) Miniature Serial Interface (MSI) Receiver Cards to include next-generation Application Specific Integrated Circuit (ASIC) and 2) Joint, Modernized Handheld Receiver.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203164SF *I NAVSTAR Global Positioning System (User Equipment) (SPACE)*

authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This Program Element (PE) may include necessary civilian pay expenses required to manage, execute, and deliver MGUE weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in PEs 1206392SF and 1206398SF.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	390.704	340.178	0.000	340.178
Current President's Budget	0.000	380.704	434.194	0.000	434.194
Total Adjustments	0.000	-10.000	94.016	0.000	94.016
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-10.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	94.016	0.000	94.016

Change Summary Explanation

FY 2021: -10.000M Congressional Reduction for maritime/ground card integration prior year carryover
FY 2022: +99.400M Addresses GPS enterprise modernization requirements to respond to evolving threats and enhances warfighting effectiveness; continues development of a fieldable aviation/maritime M-Code capability.
FY 2022: -5.384M; funding decreased to adjust for inflation

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: MGUE Inc 1	0.000	54.279	78.347
Description: The MGUE Inc 1 program develops standard modernized receiver form factors for the Service-nominated lead platforms in accordance with the MGUE Inc 1 CDD.			
FY 2021 Plans:			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203164SF *I NAVSTAR Global Positioning System (User Equipment) (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Support completion of the following: Lead Platform Integration, and Card level PEO Certification for Operational Test and Evaluation (OT&E). Continue to assist each lead platform office in integrating and testing M-Code receivers in their respective platforms. Continue Verification Testing, Qualification Testing, Technical Requirements Verification for all 5 MGUE cards. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Continue towards completion of the following: Assist B-2 and DDG lead platform offices in integrating and testing M-Code receivers in their respective platforms. Card level PEO Certification for Operational Test and Evaluation (OT&E) or Field Test. Continue Verification Testing, Qualification Testing, Technical Requirements Verification for remaining MGUE cards. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021. Increase supports Development and Verification Testing, Qualification Testing, Technical Requirements Verification for the remaining MGUE cards.			
Title: Advanced Technology ***Description:*** Advanced Technology/Pre-Tech includes efforts to mature technology for future GPS receivers called out in the MGUE CDDs. These efforts aim to find innovative solutions to increase resiliency in GPS performance and improve on size, weight, power, and cost (SWAP/C) of military receivers. ***FY 2021 Plans:*** Continue developing new technologies to increase the robustness and resilience of GPS receiver / PNT system solutions. Start integration of the next-generation GPS security solution into a software defined radio to verify functionality, programmability/ flexibility, and certifiability. Progress the Military Underwater Navigation System to CDR and begin the planning process M-Code implementation. Advance the integrated antenna, antenna electronics and M-Code capability to PDR. Start working with platforms for integration / test planning and potential transition opportunities. Implement and test advanced trust / integrity algorithms that might permit military use of other GNSS signals for delivering assured PNT. ***FY 2022 Plans:*** Continue developing technologies and prototypes to increase the robustness and resilience of GPS receiver / PNT system solutions. Complete the integration of the next-generation, Government developed intellectual property identified as "MoPD", GPS security architecture, into a multi-GNSS software defined radio platform and demonstrate functional performance, programmability / flexibility, and certifiability. Continue the M-Code Military Underwater Navigation System Government test	0.000	3.870	12.550

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203164SF *I NAVSTAR Global Positioning System (User Equipment) (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
activities and work with US Special Forces and FMS customers on transition opportunities. Complete fabrication of initial integrated antenna, antenna electronics and M-Code prototype and conduct design validation testing to evaluate TRD compliance and access effort for production representative units. Select advanced anti-spoof / trust / integrity algorithms to implement and test that might permit military use of other GNSS signals for delivering assured PNT. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021. The increase is to support integrating the next-generation, government developed MoPD intellectual property, GPS security architecture, into a multi-GNSS software defined radio platform and demonstrate functional performance, programmability / flexibility, and certifiability.			
Title: System/Platform Integration and Performance Certification ***Description:*** Integration of MGUE Inc 1 receiver form factors into the Service-nominated lead platforms in support of developmental and operational (or field) test events. Conduct technical and operational modernization impact analysis for MGUE Service lead platform integration. ***FY 2021 Plans:*** Complete developmental test of the ground-based and aviation/maritime lead platform efforts. Continue lead platform integration efforts in support of operational test events. Assist DoD integration of M-Code GPS receivers for Joint Service non-lead platforms. ***FY 2022 Plans:*** Continue verification testing of remaining GRAM-S/M cards. Continue requirements verification and reliability test activities as required to include approved engineering changes. Complete lead platform development efforts to on-board minimum viable product GRAM-S/ M capabilities, and begin final B-2 and DDG integration and qualification efforts in support of developmental and operational or field test events. Assist DoD integration of M-Code GPS receivers for joint Service non-lead platforms. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY2022 increased compared to FY2021. Increase reflects significant additional lead platform technical staff to integrate the final GRAM-S/M card build, scheduled for delivery in FY22, into the B-2 and DDG lead platforms. This includes conducting higher-level assembly qualification testing prior weapons system-level integration and test.	0.000	18.725	30.570
Title: Information Assurance, Security/Compatibility Certification, and Test/Evaluation ***Description:*** Develop, implement, and maintain GPS security certification programs. Develop policy, strategy and resource requirements for MGUE security certification and compatibility certification. Security certification, compatibility certification, and security approval ensures future military GPS receivers protect critical program information and continue working in all environments and concepts of operations called for by U.S. Strategic Command.	0.000	7.662	8.425

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203164SF *I NAVSTAR Global Positioning System (User Equipment) (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: Continue to conduct security certification activities for all M-Code receivers, as required. Continue modernized security evaluations/tests for Selective Availability Anti-Spoofing Module (SAASM) and other legacy GPS receiver equipment. Review, approve, and track SAASM, M-Code receivers, and legacy receiver certified platforms and integrated applications for all of DoD. Continue to conduct delta certifications, as required. For the Ground Base-GPS Receiver Application Module - Military Code (GBGRAM- M) and the GPS Receiver Application Module-Standard Electronic Module/M-Code (GRAM-S/M) complete verification testing for all remaining MGUE cards. Continue requirements verification and reliability test activities as required to include approved engineering changes. Continue Lead Platform Integration Test and Operational Test (OT) activities for MGUE and Lead Platform vendors. ***FY 2022 Plans:*** Continue to conduct security certification activities for all M-Code receivers, as required. Continue modernized security evaluations/tests for Selective Availability Anti-Spoofing Module (SAASM) and other legacy GPS receiver equipment. Continue to review, approve, and track SAASM, M-Code receivers, and legacy receiver certified platforms and integrated applications for all of DoD. Continue the GPS Receiver Application Module-Standard Electronic Module/M-Code (GRAM-S/M) verification testing for all remaining MGUE cards. Continue to conduct delta certifications, as required. Continue requirements verification and reliability test activities as required to include approved engineering changes. Continue Lead Platform Integration Test and Operational Test (OT) activities for MGUE and Lead Platform vendors. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021. The increase provides additional technical support for the increasing number of derivative M-code receivers being developed by the vendors for non-Lead Platform.			
Title: MGUE Inc 2 Risk Reduction	0.000	90.245	23.111
Description: The MGUE Inc 2 program will develop M-Code receiver technology to meet Service requirements. MGUE Inc 2 Risk Reduction activities include, but are not limited to, acquisition strategy development, early design efforts through Preliminary Design Review (PDR) for the next generation ASIC using 14nm ASIC technology node, handheld design activities and early user demonstrations, advanced concept studies, receiver component prototyping to include MGUE Inc 2 requirements. ***FY 2021 Plans:*** Complete ASIC PDR on three independent contractor designs. Continue M-Code Handheld risk reduction activities, to include prototype demonstrations. Continue additional Handheld risk reduction activities to address challenging Increment 2 performance			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203164SF *I NAVSTAR Global Positioning System (User Equipment) (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
requirements, improve user functionality, and reduce unit cost. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Continue M-Code Handheld risk reduction activities, to include prototype demonstrations. Continue additional Handheld risk reduction activities to address challenging Increment 2 performance requirements, improve user functionality, and reduce unit cost. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021. The decrease results from the completion of the ASIC PDR contracts in FY2021, allowing the program to focus on remaining Handheld risk reduction activities in FY2022.			
Title: MGUE Inc 2 Miniature Serial Interface (MSI) Receiver Card Rapid Prototyping	0.000	205.923	281.191
Description: The MGUE Inc 2 program will develop M-Code receiver technology for additional applications (space receivers, precision guided munitions, and handheld receivers) to meet Service requirements. MGUE Inc 2 MSI Receiver Card Rapid prototyping builds on the ASIC post-PDR progress and will develop, integrate, produce, and test M-Code capable, low size & power GPS MSI form factor to include a Next Generation (Gen) ASIC. The MSI receiver card is to meet the needs of low size, weight and power (SWaP) ground-embedded users. However, The Next Gen ASIC must meet the needs of the MSI form factor and be backwards compatible with Inc 1 performance requirements as a potential functional replacement due to Inc 1 ASIC obsolescence. MGUE Inc 2 MSI Receiver Card Rapid Prototyping has been broken out into a separate major thrust for additional visibility. ***FY 2021 Plans:*** Award up to 3 development contract(s) for new low size/power MSI receiver card to include next generation ASIC post PDR and integration activities. Continue to secure core ASIC technology, and begin early ASIC fabrication and manufacturing activities, and Intellectual Property. Continue ASIC technology design/ manufacturing/test activities. Continue security certification and design activities; procure test equipment and articles. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Continue 3 development contract(s) for new low size/power MSI receiver card to include next generation ASIC, hardware, and software. Begin all efforts related to the prototypes, including but not limited to, ordering of components for early integrated testing, long-lead parts planning and purchase, procurement of test equipment and articles, facilities planning, manufacturing prototypes,			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203164SF *I NAVSTAR Global Positioning System (User Equipment) (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
and manpower. Begin preparations for CDR planned for 4th quarter FY 2023. In addition to preparing for CDR, the contractors will be verifying through demonstrations and testing that performance requirements will be met. Continue security certification and design activities. Continue investments in core ASIC technology, early ASIC fabrication, manufacturing, and Intellectual Property procurement. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021. The increase coincides with the kickoff and execution of the CDR campaign for all three development contractor efforts, beginning integration testing, continuing long-lead parts planning and purchase, and procurement of test equipment and articles in FY 2022.			
Accomplishments/Planned Programs Subtotals	0.000	380.704	434.194

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• GPSSPC: *Global Postioning (Space)*	-	2.256	2.274	-	2.274	-	-	-	-	-	-

Remarks

Procurement, Space Force (PSF) funding in this PE supports legacy SAASM efforts. Similar work for the MGUE is in the planning phase.

E. Acquisition Strategy

The MGUE program has developed a comprehensive acquisition strategy to provide modernized GPS capabilities to U.S. and Allied Forces by developing a competitive market driven approach. This strategy establishes the signal compatibility and security criteria along with a process for evaluating components to enable rapid movement from development to fielding. The pillars of this effort are: (a) establishing time certain and low risk development; (b) bounding requirements to leverage mature technology to the maximum extent possible; (c) focusing on the development of form factors based on well-defined standards to support lead platform integration; and (d) implementing a proactive, collaborative MGUE platform integration activity to mitigate risk and reduce cost for DoD force structure modernization.

The MGUE program awarded three sole source contracts for the Inc 1 Technology Development Phase effort in September 2012, as follow-on efforts to the competitively awarded Modernized User Equipment (MUE) contracts awarded in June 2006. The effort spans the Technology Maturation and Risk Reduction Phase through design and includes integration and test of M-Code receivers into Service-nominated lead platforms. In 1QFY2021, the program office converted the remaining Raytheon GRAM-S/M development effort to a Firm Fixed Price contract type at the direction of the Air Force Service Acquisition Executive. The contracts of the other two vendors remain primarily a Cost Plus Incentive Fee type contract. This effort also includes the security and compatibility certification of GPS receiver cards as a

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203164SF *I NAVSTAR Global Positioning System (User Equipment) (SPACE)*

part of the integration effort. The Service lead platforms will select from the available vendors to integrate and perform operational testing with funding from the MGUE program. This supports compliance with PL 111-383, section 913.

The MGUE Inc 2 program developed an Acquisition Strategy to continue MGUE development by: addressing long term producibility of MGUE ASICs, identifying a U.S. owned trusted foundry for ASIC development, delivering GPS receiver cards to meet stringent Inc 2 requirements, and developing a modernized GPS handheld receiver to meet the needs of the Services. The MGUE Inc 2 program is being executed in three parts: 1) Risk Reduction Activities, 2) MSI Middle Tier Acquisition rapid prototyping, and 3) Joint Modernized GPS Handheld Receiver Middle Tier Acquisition rapid prototyping effort. The Air Force Service Acquisition Executive approved the MGUE Inc 2 Acquisition Strategy to include designation of two Middle Tier Acquisition Rapid Prototype efforts: 1) Miniature Serial Interface Receiver Card (includes next-generation (ASIC) and 2) Joint, Modernized Handheld Receiver. MGUE Inc 2 awarded 3 full and open competitive contracts in Nov 2020 for MSI. The program office plans to award full and open competitive Handheld contracts beginning in FY 2023.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1203164SF / *NAVSTAR Global Positioning System (User Equipment) (SPACE)*	**Project (Number/Name)** 643833 / *MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MGUE Inc 1 Technology Development (1)	C/CPIF	Collins Aerospace : Cedar Rapids, IA	0.000	-		0.000	Nov 2020	10.100	Nov 2021	-		10.100	-	-	167.971
MGUE Inc 1 Technology Development (2)	C/CPIF	Raytheon : El Segundo, CA	0.000	-		32.752	Nov 2020	53.209	Nov 2021	-		53.209	-	-	-
MGUE Inc 1 Technology Development (3)	C/CPIF	L3 Harris : Anaheim, CA	0.000	-		0.770	Nov 2020	6.400	Nov 2021	-		6.400	-	-	-
MGUE Inc 1 Platform Integration	Various	Various : Various	0.000	-		15.670	Nov 2020	29.669	Nov 2021	-		29.669	-	-	-
MGUE Inc 1 Information Assurance	Various	Various : Various	0.000	-		2.130	Jan 2021	0.400	Jan 2022	-		0.400	-	-	-
MGUE Inc 1 Technical Mission Analysis	MIPR	Aerospace/MITRE : El Segundo, CA	0.000	-		8.806	Oct 2020	2.700	Nov 2021	-		2.700	-	-	-
MGUE Inc 1 Enterprise SE&I	C/CPAF	SAIC : El Segundo, CA	0.000	-		3.055	Oct 2020	1.000	Dec 2021	-		1.000	-	-	-
MGUE Pre-Tech	Various	Various : Various	0.000	-		3.870	Jan 2021	12.550	Jan 2022	-		12.550	-	-	-
MGUE Security Certification	Various	Various : Various	0.000	-		5.532	Jan 2021	2.910	Nov 2021	-		2.910	-	-	-
MGUE Inc 2 MSI Receiver Card Rapid Prototyping	Various	Various : Various	0.000	-		94.205	Dec 2020	78.287	Dec 2021	-		78.287	-	-	-
MGUE Inc 2 Technology Development (1)	C/CPIF	BAE Systems : Cedar Rapids, IA	0.000	-		30.305	Dec 2020	59.335	Nov 2021	-		59.335	-	-	-
MGUE Inc 2 Technology Development (2)	C/CPIF	L3 Harris : Anaheim, CA	0.000	-		30.305	Dec 2020	44.390	Nov 2021	-		44.390	-	-	-
MGUE Inc 2 Technology Development (3)	C/CPIF	Raytheon : El Segundo, CA	0.000	-		30.305	Dec 2020	54.000	Nov 2021	-		54.000	-	-	-
MGUE Inc 2 Risk Reduction	Various	Various : Various	0.000	-		80.089	Jan 2021	23.111	Nov 2021	-		23.111	-	-	-
MGUE Inc 2 Information Assurance	Various	Various : Various	0.000	-		-		4.495	Nov 2021	-		4.495	-	-	-
MGUE Inc 2 Technical Mission Analysis	MIPR	Aerospace/MITRE : El Segundo, CA	0.000	-		6.490	Jan 2021	15.773	Nov 2021	-		15.773	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1203164SF / *NAVSTAR Global Positioning System (User Equipment) (SPACE)*	Project (Number/Name) 643833 / *MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MGUE Inc 2 Enterprise SE&I	C/CPAF	SAIC : El Segundo, CA	0.000	-		3.382	Jan 2021	4.269	Jan 2022	-		4.269	-	-	-
		Subtotal	0.000	-		347.666		402.598		-		402.598	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MGUE Inc 1 Test and Evaluation	Various	Various : Various	0.000	-		0.000		0.000	Jan 2022	-		0.000	-	-	-
MGUE Inc 2 Test and Evaluation	Various	Various : Various	0.000	-		1.540	Jan 2021	2.284	Jan 2022	-		2.284	-	-	-
		Subtotal	0.000	-		1.540		2.284		-		2.284	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
MGUE Inc 1 FFRDC	Various	Aerospace/MITRE : Various	0.000	-		7.795	Dec 2020	1.557	Dec 2021	-		1.557	-	-	-
MGUE Inc 2 FFRDC	Various	Aerospace/MITRE : Various	0.000	-		5.276	Dec 2020	6.152	Dec 2021	-		6.152	-	-	-
MGUE Inc 1 A&AS	Various	Various : Various	0.000	-		3.966	Dec 2020	3.860	Dec 2021	-		3.860	-	-	-
MGUE Inc 2 A&AS	Various	Various : Various	0.000	-		14.151	Dec 2020	17.503	Dec 2021	-		17.503	-	-	-
MGUE Inc 1 and Inc 2 Other Support	Various	Various : TBD	0.000	-		0.310	Dec 2020	0.240	Oct 2021	-		0.240	-	-	-
		Subtotal	0.000	-		31.498		29.312		-		29.312	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1203164SF / *NAVSTAR Global Positioning System (User Equipment) (SPACE)*	Project (Number/Name) 643833 / *MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		380.704		434.194		-		434.194	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1203164SF / *NAVSTAR Global Positioning System (User Equipment) (SPACE)*	**Project (Number/Name)** 643833 / *MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP*

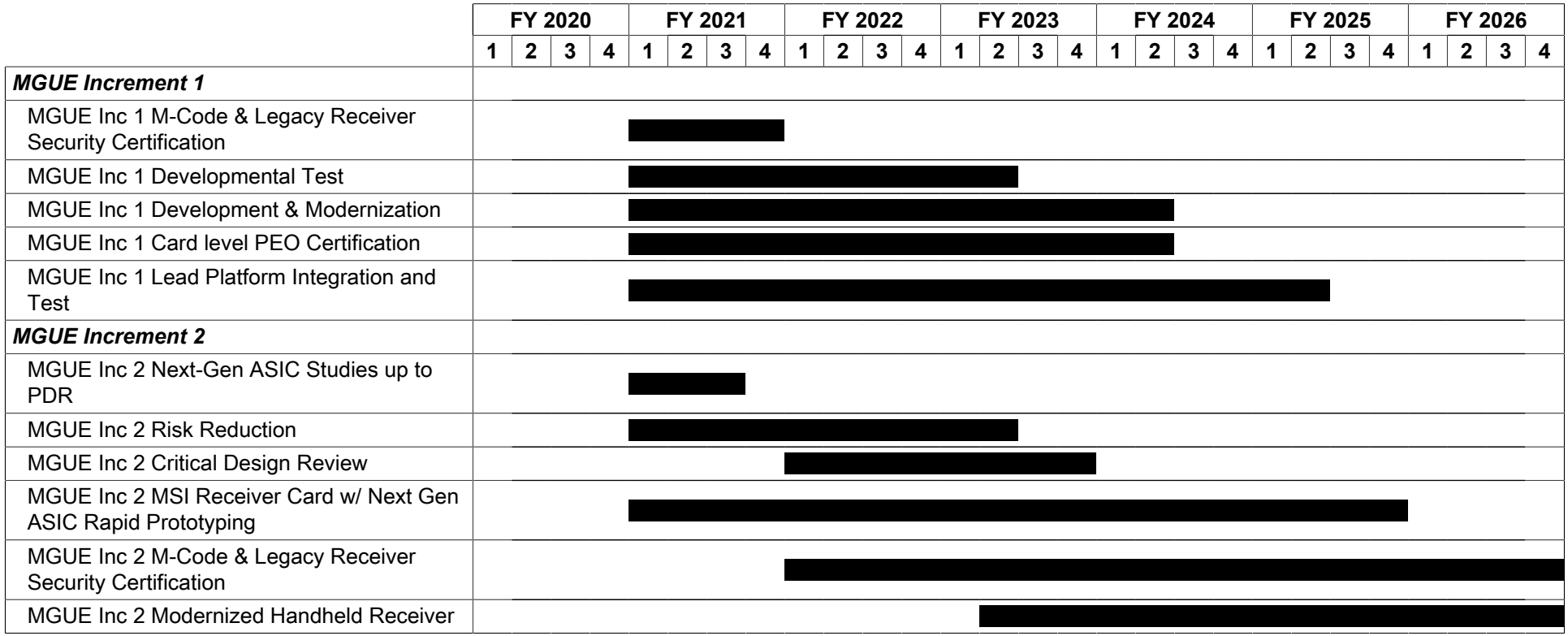

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1203164SF / *NAVSTAR Global Positioning System (User Equipment) (SPACE)*	**Project (Number/Name)** 643833 / *MILITARY GLOBAL POSITIONING SYSTEM USER EQUIP*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MGUE Increment 1				
MGUE Inc 1 M-Code & Legacy Receiver Security Certification	1	2021	4	2021
MGUE Inc 1 Developmental Test	1	2021	2	2023
MGUE Inc 1 Development & Modernization	1	2021	2	2024
MGUE Inc 1 Card level PEO Certification	1	2021	2	2024
MGUE Inc 1 Lead Platform Integration and Test	1	2021	2	2025
MGUE Increment 2				
MGUE Inc 2 Next-Gen ASIC Studies up to PDR	1	2021	3	2021
MGUE Inc 2 Risk Reduction	1	2021	2	2023
MGUE Inc 2 Critical Design Review	1	2022	4	2023
MGUE Inc 2 MSI Receiver Card w/ Next Gen ASIC Rapid Prototyping	1	2021	4	2025
MGUE Inc 2 M-Code & Legacy Receiver Security Certification	1	2022	4	2026
MGUE Inc 2 Modernized Handheld Receiver	2	2023	4	2026

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1203710SF / *EO/IR Weather Systems*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	131.000	162.274	0.000	162.274	-	-	-	-	-	-
643730: *EO/IR Weather System Dev*	-	0.000	131.000	162.274	0.000	162.274	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In compliance with 2016 National Defense Authorization Act (NDAA) and Joint Requirements Oversight Council (JROC) Memo 062-17, dated 20 Jun 2017, EWS will provide global Low-Earth Orbit (LEO) coverage to meet Space-Based Environmental Monitoring (SBEM) EO/IR Gaps 1) Cloud Characterization (CC) and 2) Theatre Weather Imagery (TWI), and succeed the aging Defense Meteorological Satellite Program (DMSP) constellation. Without the CC and TWI data, Space Force production of global predictive weather data will be severely impacted, affecting daily air operations and intelligence gathering for strategic mission planning, especially around the contested environment.

Based on SBEM Capability Assessment and Strategy Review (CASR) in April 2019, the current EWS acquisition strategy focuses on a distributed LEO architecture, for scalability and increased operational resilience. The Space Force will pursue prototyping of latest industry capabilities for simplified sensor designs, while meeting CC and TWI requirements and data latencies in a distributed architecture.

The FY 2022 funding request was reduced by 9.715 million to account for the availability of prior year execution balances.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver EWS weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203710SF *I EO/IR Weather Systems*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	131.000	174.000	0.000	174.000
Current President's Budget	0.000	131.000	162.274	0.000	162.274
Total Adjustments	0.000	0.000	-11.726	0.000	-11.726
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-11.726	0.000	-11.726

Change Summary Explanation

FY 2022: -$9.715M reduction for underexecution; -$2.011 inflation adjustment

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Electro-Optical/Infrared Weather System (EWS)	0.000	131.000	162.274

Description: The EWS program will focus on an overlapping three-phased approach intended to mature multi-spectral imaging capabilities to collect and disseminate terrestrial atmospheric phenomena to support Department of Defense operations. This effort includes competitive prototyping of the sensor and bus design, development, integration, test, launch and on-orbit demonstrations. This effort will also assess industrial capabilities to provide CC and TWI data in a viable commercial business hosted on a proliferated LEO mesh network. To minimize risks associated with competitive sensor/satellite vehicle prototyping, and the need to replace the DMSP constellation in a timely manner, the Program Office is simultaneously requesting solution papers to inform a decision to pursue a competitively-awarded, more technically-mature EO/IR system design prototype from industry. Per the SECAF-approved SBEM Acquisition Strategy, the EWS will continue supporting smaller sensor development and data utility assessment (Phase I), competitively prototype sensor and bus designs for a proliferated-LEO architecture while leveraging the existing SBEM Family of Systems (Phase II), and on-ramp to an operational system based on the success of Phase II in time for DMSP replacement. Leveraging the success of these efforts, the Program Office intends to field an affordable and highly capable operational system in Phase III.

FY 2021 Plans:

For EWS Phase II SpEC OT #1a, Vendors A, B, and C will continue to compete on prototype system build, integration, test, and preparation for launch. The program office will make a down-select decision to reduce the number of competing vendors from three to two to continue to prepare for launch. For SpEC OT #1b, an awarded vendor will conclude its development of a

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203710SF *I EO/IR Weather Systems*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
model for providing weather data as a service, which the program office will assess its viability. For SpEC OT#2, the program office will initiate high-maturity sensor sprints for the space vehicle, and associated ground development activities to support an Initial Design Review event. The program office will also conclude its study of leveraging legacy weather satellite hardware and associated ground equipment as part of managing technical risks associated with EWS prototyping. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2022 Plans:*** For Phase II Modernized Pathfinder efforts: Under SpEC OT 1a, complete competitive prototype sensor and bus build between Vendor A and the program office's choice of either Vendor B or Vendor C. Continue integration, test, and associated launch activities between the two prototype competitors, launching in FY 2022 and FY 2023 respectively. Knowledge gained from Phase II will inform the analysis for the Phase III Operational Follow-on decision, culminating in presentation of the Acquisition Strategy to Milestone Decision Authority for approval. For Phase III Operational Follow-on: Use the sensor test and on-orbit demo results from the Phase II prototype launches to conduct all relevant acquisition strategy development and associated activities leading to award for Phase III Operational Follow-on in FY 2022. Begin all efforts related to the operational follow-on, including but not limited to, ordering of flight and ground components for early integrated testing, long-lead parts planning and purchase, procurement of contractor and government provided test equipment, manufacturing prototypes, and manpower ramp-up. These efforts will support the NDAA mandated 2025 Initial Launch Capability (ILC) requirement. Additionally, FY 2022 funding will allow the program to rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased to award Phase III Operational Follow-on contracts.			
Accomplishments/Planned Programs Subtotals	0.000	131.000	162.274

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203710SF / *EO/IR Weather Systems*

E. Acquisition Strategy

In accordance with the SECAF-approved SBEM Acquisition Strategy (Sep 2020), the Space Force will continue to address Joint SBEM gaps with a combination of DoD materiel and non-materiel solutions, partnerships, and commercial, civil, and allied data. EWS will continue to use Section 815, Other Transaction Authority (OTA), to competitively pursue a scalable, proliferated-LEO architecture based on technological advancements in smaller sensor design and leveraging commercial-based capabilities.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1203710SF / *EO/IR Weather Systems*	Project (Number/Name) 643730 / *EO/IR Weather System Dev*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Phase II Risk Mitigation	C/Various	TBD : TBD	-	-		27.300	Dec 2020	-		-		-	-	-	-
Phase II	C/Various	Various : TBD	-	-		79.400	Dec 2020	116.239	Dec 2021	-		116.239	-	-	-
Phase III	TBD	TBD : TBD	-	-		0.300	Mar 2021	30.500	Jul 2022	-		30.500	-	-	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-		11.000	Nov 2020	3.311	Jan 2022	-		3.311	-	-	-
Enterprise Systems Engineering & Integration	C/CPIF	Engility Corp : Andover, WA	-	-		2.000	Nov 2020	2.590	Jan 2022	-		2.590	-	-	-
		Subtotal	-	-		120.000		152.640		-		152.640	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace Corp : El Segundo, CA	-	-		4.800	Nov 2020	3.040	Jan 2022	-		3.040	-	-	-
A&AS	Various	Various : Various	-	-		3.700	Nov 2020	6.513	Jan 2022	-		6.513	-	-	-
Other Support	Various	Various : Various	-	-		2.500	Jun 2021	0.081	Oct 2021	-		0.081	-	-	-
		Subtotal	-	-		11.000		9.634		-		9.634	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		131.000		162.274		-		162.274	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1203710SF / *EO/IR Weather Systems*	**Project (Number/Name)** 643730 / *EO/IR Weather System Dev*

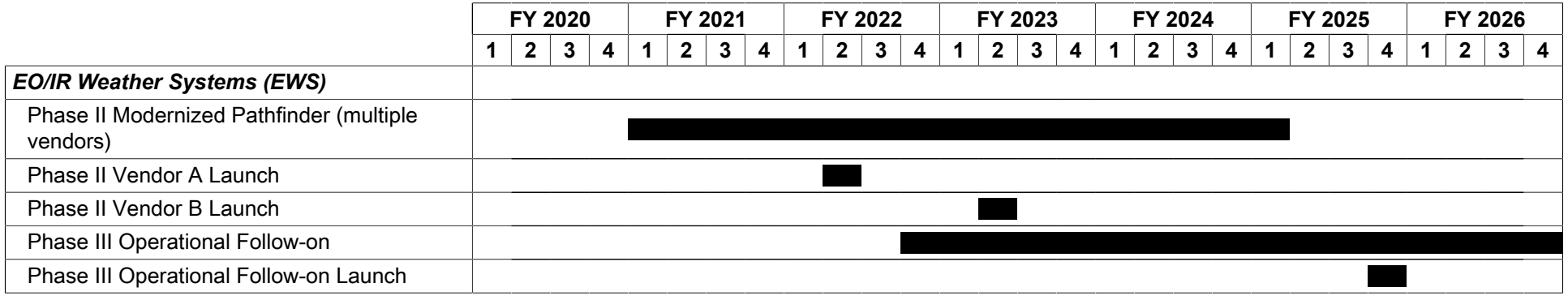

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1203710SF / *EO/IR Weather Systems*	**Project (Number/Name)** 643730 / *EO/IR Weather System Dev*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
EO/IR Weather Systems (EWS)				
Phase II Modernized Pathfinder (multiple vendors)	1	2021	1	2025
Phase II Vendor A Launch	2	2022	2	2022
Phase II Vendor B Launch	2	2023	2	2023
Phase III Operational Follow-on	4	2022	4	2026
Phase III Operational Follow-on Launch	4	2025	4	2025

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1203905SF / *Space System Support*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	37.000	0.000	37.000	-	-	-	-	-	-
646021: *Space Warfighting Analysis Center (SWAC)*	-	0.000	0.000	37.000	0.000	37.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 4, PE 1203905SF, project 646021, Space Warfighting Analysis Center, is a new start.

A. Mission Description and Budget Item Justification

As part of the continuing organization and stand up of the United States Space Force (USSF), a number of autonomous functions/missions are being aligned and combined with emerging mission requirements to establish a dedicated USSF force design and resiliency function. USSF initiated and activated the Space Warfighting Analysis Center (SWAC) in mid-FY 2021, and programmed FY 2022 funding to enable the organization to begin conducting its specialized mission. In the absence of a newly-created, SWAC-specific Program Element (PE) at the time of this budget request (FY 2022 President's Budget), the SWAC will conduct its FY 2022 efforts from PE 1203905SF (Space System Support) and the 3620 Research, Development, Test, & Evaluation appropriation.

This funding in PE 1203905SF, Space System Support provides initial funding for the USSF SWAC. The SWAC conducts analysis, modeling, wargaming, and experimentation to create operational concepts and Force Design guidance for USS missions. SWAC Force Design identifies the integrated suite of capabilities that fulfills USSF imperatives to preserve the United States' freedom of action in space; enable Joint Force lethality and effectiveness; and provide independent options in, from, and to space. SWAC's analyses and products support USSF decision making processes for resourcing, policy development and operational planning. SWAC wargaming and simulation activities support initial tactics, techniques and procedures (TTP) development and maturation.

The SWAC's scope includes developing integrated Force Design guidance for 2 Centers of Excellence (COE); Multi-Domain Awareness and Spectrum Warfare. The Multi-Domain Awareness COE conducts discovery, analysis, and validation activities to inform Force Design guidance for the missile warning, missile tracking; multi-spectral sensing (MSS); tactical intelligence, surveillance, and reconnaissance (T-ISR)); and space-based environmental monitoring (SBEM) mission areas. The Spectrum Warfare COE will conduct comparable activities for data transport and receive networks (DTRN); satellite communications (SATCOM); position, navigation and timing (PNT) and navigational warfare (NAVWAR); Command and Control (C2); and Launch and On-orbit Servicing mission areas. Leveraging the SWAC headquarters element-equivalent functions, the collective results of the SWAC and its COEs activities will enable, optimize, inform, improve USSF missions through decision making processes for resourcing, policy development, and operational planning.

Ultimately, the SWAC will support a position of strategic stability, United States advantage in space, and a space warfighting posture that deters aggression and ensures Joint and Coalition warfighters can employ forces in the time, place, manner and domain of their choosing; ultimately fostering a continued posture enabling the United States to fight and win in space.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203905SF / *Space System Support*

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	37.000	0.000	37.000
Total Adjustments	0.000	0.000	37.000	0.000	37.000
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	37.000	0.000	37.000

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Warfighting Analysis Center	-	0.000	37.000

Description: Space Warfighting Analysis Center will be resourced to inform operational concepts and Force Design guidance for United States Space Force missions by conducting analysis, modeling, wargaming, and experimentation for RDT&E purposes.

FY 2021 Plans:
N/A

FY 2022 Plans:
FY 2022 funding enables the Space Warfighting Analysis Center (SWAC) to organize and initiate the capability to conduct analysis, modeling, wargaming and experimentation to create operational concepts and develop Force Designs for the full spectrum of United States Space Force (USSF) missions. The SWAC's initial operational capability in FY 2022 will specifically focus on its Multi-Domain Awareness and Spectrum Warfare Centers of Excellence to plan and execute activities that inform the USSF's most pressing Force Design guidance. The Multi-Domain Awareness and Spectrum Warfare Center Of Excellence will conduct research studies, system design analysis and wargaming experimentation prototyping demonstrations across a variety of domains and mission areas to inform USSF Force designs for RDT&E purposes. Activities will discover, analyze, and validate technologies, systems, and architectures for the highest priority mission areas; their products will inform USSF resourcing, policy,

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1203905SF *I Space System Support*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
and development decisions, as well as operational planning. Embedded in this work, SWAC will be establishing foundational modeling standards, guidelines, and identifying best practices to enable critical analysis, simulation, and wargaming. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A			
Accomplishments/Planned Programs Subtotals	-	0.000	37.000

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1203905SF / *Space System Support*	**Project (Number/Name)** 646021 / *Space Warfighting Analysis Center (SWAC)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Space Warfighting Analysis Center	Various	Various - TBD : TBD	-	-		-		37.000	Dec 2021	-		37.000	-	-	-
		Subtotal	-	-		-		37.000		-		37.000	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		37.000		-		37.000	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1203905SF / *Space System Support*	**Project (Number/Name)** 646021 / *Space Warfighting Analysis Center (SWAC)*

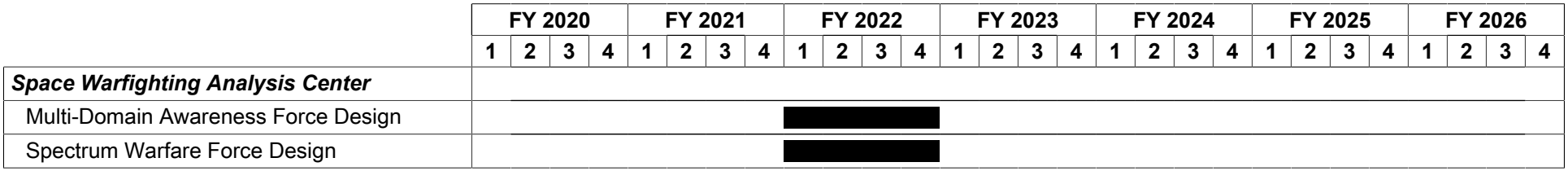

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1203905SF / *Space System Support*	**Project (Number/Name)** 646021 / *Space Warfighting Analysis Center (SWAC)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Space Warfighting Analysis Center				
Multi-Domain Awareness Force Design	1	2022	4	2022
Spectrum Warfare Force Design	1	2022	4	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206422SF *I Weather System Follow-on*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	83.384	61.521	0.000	61.521	-	-	-	-	-	-
644289: *Weather Satellite Follow-On*	0.000	0.000	83.384	61.521	0.000	61.521	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Weather System Follow-on (WSF) is a Low-Earth Orbit (LEO) microwave imaging system developed and delivered by the United States Space Force's Space & Missile Systems Center (SMC). WSF is the next generation of space-based passive microwave sensing technology. It will provide U.S. and Allied warfighters with essential weather data, including the measurement of ocean surface wind speed and direction, ice thickness, snow depth, soil moisture, and local spacecraft energetic charged particle environment. The ocean surface wind speed measurement enables tropical cyclone intensity determination by the Joint Typhoon Warning Center. The data gathered by WSF will be provided to meteorologists in support of the generation of a wide variety of weather products necessary to conduct mission planning and operations globally every day.

WSF is an Acquisition Category IB program comprised of two Space Vehicles (SV) and their associated command, control, and data dissemination network. Similar to the heritage Defense Meteorological Satellite Program, global data is gathered, stored, and down-linked through the Satellite Control Network (SCN) and disseminated to Air Force, Navy, and civil partners. Additionally, data is broadcast real time by the satellite for utilization by heritage Direct Readout Terminals that use the data for local weather forecasting.

WSF is declared a Major Defense Acquisition Program (MDAP) with the Space Force as the lead component. Based on the Space-Based Environmental Monitoring (SBEM) Analysis of Alternatives (AoA) results, the WSF initial thrusts will be to enable:

1) DoD use of data collected by civil, international and other DoD space systems;
2) Timely weather collection over broad oceans in support of maneuvering forces;
3) Space weather capabilities to characterize operational orbits, space situational awareness, and the ionosphere.

Secondary investments may be supported to address weather gaps identified in the SBEM AoA and validated by the JROC. Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center has transformed the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/ classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206422SF *I Weather System Follow-on*

This program element may include necessary civilian pay expenses required to manage, execute, and deliver WSF weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	83.384	62.284	0.000	62.284
Current President's Budget	0.000	83.384	61.521	0.000	61.521
Total Adjustments	0.000	0.000	-0.763	0.000	-0.763
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-0.763	0.000	-0.763

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: WSF Microwave Satellite (SV1-2)	0.000	80.160	60.548

Description: Develop, build, integrate, and test the WSF Microwave (WSF-M) satellites, including bus, payloads, and ground upgrades to satisfy JROC-directed SBEM Capability gaps.

FY 2021 Plans:
Continue Microwave Imaging (MWI) flight payload Integration & Test (I&T). Initiate SV-1 I&T to accommodate the MWI flight payload. Continue WSF-M Ground Segment Development to include, but not limited to Command and Control System Mission Unique Software (MUS) to operate the WSF-M SV. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.

FY 2022 Plans:
Complete the manufacturing of MWI payload and continue SV-1 I&T. Receive all Spacecraft hardware deliveries from the subcontractors, and continue Bus Integration. Complete WSF-M Ground Segment Development to include, but not limited to Command and Control System MUS to operate the WSF-M SV. Initiate and complete WSF-M Ground Segment Integration & Test, to include, but not limited to Day-In-The-Life Compatibility testing. Additionally, FY 2022 funding will allow the program to

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206422SF *I Weather System Follow-on*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY22 decreased due to the completion of long lead parts orders and the transition into system level production and test.			
Title: COWVR Tech Demo ***Description:*** The Compact Ocean Surface Wind Vector Radiometer (COWVR) launch objective supports Category A Weather Requirements, as codified in JROC Memo 092-014, providing on-orbit technology demonstration of the new COWVR technology to deliver Weather Gap #3, Ocean Surface Vector Winds (OSVW) and Gap #8, Tropical Cyclone Intensity (TCI). This will be a cooperative mission with NASA for integrating the sensor onto the International Space Station (ISS) as a weather technology demonstration project. The new mission designation for the COWVR launch will be Space Test Program Houston Mission #8 (STP-H8). Demonstrating COWVR technology in the space environment remains an important milestone for the microwave data weather mission in lieu of the ORS-6 cancellation. Unlike ORS-6, COVWR will fly on the ISS and the residual operational capability is not guaranteed as a result. ***FY 2021 Plans:*** Complete launch preparations for STP-H8 mission; launch STP-H8 mission onto International Space Station; integrate COWVR onto International Space Station; checkout COWVR sensor and initiate sensor data calibration/validation. This funding includes but is not limited to payload interface unit, associated electronics, integration, system and environmental testing, launch, and ground operations establishment. ***FY 2022 Plans:*** Complete the COWVR sensor calibration and validation onboard the ISS. Continue operating the sensor and gathering data for potential inclusion into current weather models. This funding includes but is not limited to payload commanding, data interpretation and dissemination, and other ground operational support. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY22 decreased due to the completion of ground data software development.	0.000	1.180	0.275
Title: ECP ***Description:*** Energetic Charged Particles (ECP) will fulfill the SBEM Weather Gap 11 and address the Secretary of the Air Force (SECAF) policy which directs each Space Force Satellite Office to plan for and integrate ECP sensors on all pre-Milestone B new satellite acquisitions. To accomplish this requirement, the ECP sensor will be integrated on the WSF-M satellite. ***FY 2021 Plans:***	0.000	2.044	0.698

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206422SF *I Weather System Follow-on*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue support to the WSF-M prime contractor for design reviews. Complete the WSF-M ECP sensor development. Fabricate and test a CEASE 3 engineering design unit. Support integration of ECP data processing software into the WSF-M ground segment. Fabricate and test ECP flight unit, put flight unit in storage until delivery to the prime contractor for integration onto WSF-M SV-1. ***FY 2022 Plans:*** Pull WSF-M ECP sensor from storage/deliver flight unit to the prime contractor, along with associated integration and test support. Complete ECP sensor data processing software and all applicable pre-launch efforts. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY22 decreased due to the completion of flight unit production and test.			
Accomplishments/Planned Programs Subtotals	0.000	83.384	61.521

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

WSF successfully completed Milestone B and has been designated a MDAP. The acquisition strategy for WSF is based on validated SBEM AoA results from FY2014 and subsequent acquisition strategy development activities that were conducted in FY 2015. The WSF acquisition strategy focuses on streamlined acquisition processes for providing materiel solutions to OSVW, TCI & LEO ECP, as validated by the JROC; deliver microwave sensing solution to address DoD needs for OSVW and TCI capabilities and deliver space environment sensing solution to address LEO ECP capabilities for on-orbit attributions and anomaly resolutions.

The Space Force is conducting a technology demonstration of the Compact Ocean Surface Wind Vector Radiometer (COWVR) sensor in partnership with NASA Space Test Program (STP) to launch and integrate with International Space Station (ISS), utilizing their unique technology demonstration capabilities for on-orbit demonstration of COWVR technology. SMC's STP is the lead Space Force organization spearheading the NASA partnership, while SMC Development Corps. is responsible for the COWVR project and funding and providing programmatic support to enable COWVR sensor to ISS integration/technology demonstration.

The program awarded a contract for WSF-M satellites, capable of meeting all three weather capability gaps, in a full and open competition environment, in order to reduce overall program cost. The Space Force is procuring one WSF-M satellite with an option for a second satellite. WSF-M first satellite (SV-1) ILC is 4th quarter FY 2023 to mitigate any potential weather coverage gaps. WSF-M SV-2 ILC, if option exercised, is 4th quarter FY 2027. The WSF SV-2 will be functionally equivalent to SV-1. Naval Research Lab Blossom Point Tracking Facility (BPTF) will be used as a viable unclassified EGS-compatible Satellite Operations Center (SOC) for WSF-M. BPTF consists of a SOC, multiple ground antennas including via AFSCN, and an existing infrastructure capable of providing space system command, control, and communications (C3).

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206422SF *I Weather System Follow-on*

The WSF ECP sensor development will leverage current AFRL sensor and hazard assessment technology to accelerate availability of ECP sensor for integration on WSF-M and other planned Space Force satellite acquisitions. The Space Force intends to transition AFRL's technology to industry for production via competitive award. Two Tech Demo ECP sensors are projected to be delivered and ready for satellite integration by FY 2022. Post-Tech Demo ECP phase, each respective program offices will be responsible for the procurement/integration and sustainment of the sensors required to meet the SecAF's Space Situational Awareness (SSA) policy.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206422SF / *Weather System Follow-on*	Project (Number/Name) 644289 / *Weather Satellite Follow-On*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
COWVR Technology Demonstration	Various	Various : Various	0.000	-		1.180	Apr 2021	0.275	Apr 2022	0.000		0.275	-	-	-
WSF Microwave System (SV1-2)	C/FFP	Ball Aerospace : Boulder, CO	0.000	-		57.023	Nov 2020	35.608	Nov 2021	0.000		35.608	-	-	-
ECP	Various	Various : Various	0.000	-		2.044	Jan 2021	0.698	Jan 2022	0.000		0.698	-	-	-
Enterprise Systems Engineering & Integration	C/CPAF	Engility Corp : Andover, MA	0.000	-		5.182	Dec 2020	4.249	Dec 2021	0.000		4.249	-	-	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	0.000	-		5.927	Oct 2020	6.247	Oct 2021	0.000		6.247	-	-	-
Ground	MIPR	NRL : Welcome, MD	0.000	-		3.236	Dec 2020	4.406	Dec 2021	0.000		4.406	-	-	-
		Subtotal	0.000	-		74.592		51.483		0.000		51.483	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	MIPR	Aerospace Corp : El Segundo, CA	0.000	-		2.809	Oct 2020	2.940	Oct 2021	0.000		2.940	-	-	-
A&AS	Various	Various : El Segundo, CA	0.000	-		5.536	Feb 2021	4.664	Feb 2022	0.000		4.664	-	-	-
Other Support	Various	Various : El Segundo, CA	0.000	-		0.447	Nov 2020	2.434	Nov 2021	0.000		2.434	-	-	-
		Subtotal	0.000	-		8.792		10.038		0.000		10.038	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		83.384		61.521		0.000		61.521	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206422SF / *Weather System Follow-on*	**Project (Number/Name)** 644289 / *Weather Satellite Follow-On*

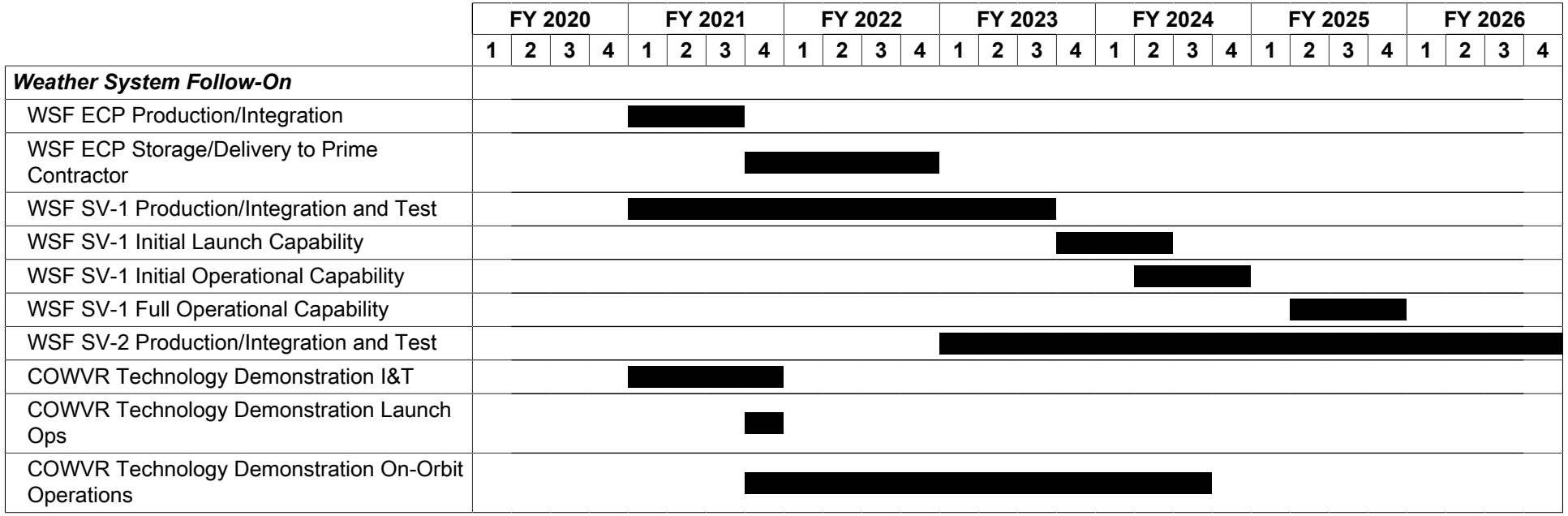

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206422SF / *Weather System Follow-on*	**Project (Number/Name)** 644289 / *Weather Satellite Follow-On*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Weather System Follow-On				
WSF ECP Production/Integration	1	2021	3	2021
WSF ECP Storage/Delivery to Prime Contractor	4	2021	4	2022
WSF SV-1 Production/Integration and Test	1	2021	3	2023
WSF SV-1 Initial Launch Capability	4	2023	2	2024
WSF SV-1 Initial Operational Capability	2	2024	4	2024
WSF SV-1 Full Operational Capability	2	2025	4	2025
WSF SV-2 Production/Integration and Test	1	2023	4	2026
COWVR Technology Demonstration I&T	1	2021	4	2021
COWVR Technology Demonstration Launch Ops	4	2021	4	2021
COWVR Technology Demonstration On-Orbit Operations	4	2021	3	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206425SF / *Space Situation Awareness Systems*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	33.359	123.262	0.000	123.262	-	-	-	-	-	-
640290: *Deep Space Advanced Radar Concept*	-	0.000	33.359	123.262	0.000	123.262	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Space Domain Awareness (SDA) is one of five core competencies of the Space Force and is the effective identification, characterization, and understanding of any factor, passive or active, associated with the space domain that could affect space operations and thereby impact the security, safety, economy, or environment of our nation. As the foundation for space control, SDA encompasses surveillance of all space objects and activities; detailed surveillance of specific space assets; monitoring space environmental conditions; monitoring cooperative space assets; gathering indications and warning on adversary space operations; and conducting integrated command, control, communications, processing, analysis, dissemination, and archiving activities.

This program element develops new network sensors and improved information integration capabilities across the space surveillance network (SSN) while companion program element 1203940SF fields, upgrades, operationalizes, operates, and maintains Space Force sensors and information integration capabilities within the SSN. Activities funded in this program element (1206425SF) also support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, modernization initiatives, systems engineering, system development, and test & evaluation, and may include prototyping and technology demonstration.

Deep Space Advanced Radar Concept (DARC) is a ground-based, SDA radar system to detect, track, and maintain custody of deep space objects 24/7, through the solar exclusion gap. DARC will augment the SSN as an additional sensor with increased capacity and capability for deep space object custody, providing full global coverage.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver DARC weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

The FY 2022 funding request was reduced by $7.5M to account for the availability of prior year execution balances.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206425SF *I Space Situation Awareness Systems*

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	33.359	141.296	0.000	141.296
Current President's Budget	0.000	33.359	123.262	0.000	123.262
Total Adjustments	0.000	0.000	-18.034	0.000	-18.034
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-18.034	0.000	-18.034

Change Summary Explanation

The FY 2022 funding request was reduced by $9M to align with phasing of program schedule. Includes $5M transferred to Ground Based Optical Sensor System (GBOSS) Project 65A037, Program Element 1203940SF, Space Situation Awareness Operations and the remainder was transferred for higher Space Force priorities. The FY 2022 funding request was reduced by $7.5M to account for the availability of prior year execution balances. The FY 2022 funding request was reduced by $1.1M to account for inflation.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: DARC Site 1 Operational Capability	-	33.359	123.262
Description: The DARC Middle Tier of Acquisition (MTA) activity will develop, test, and deliver one DARC site with a current estimated completion date of CY 2025. It will also provide a foundation for up to two more future sites located strategically around the world to provide global deep space radar capability to support SDA. The system will be responsive to regularly scheduled and un-scheduled tasks to locate, identify, characterize deep space objects and report the results to Battle Management Command and Control locations and SSN. ***FY 2021 Plans:*** Finalize and release Request for Proposal (RFP) and conduct source selection. Continue prototype build, test, and operational demonstrations, and initiate early hardware purchases for site 1 to support rapid prototyping pathway development timelines. Implement system resiliency and situational awareness changes necessary to operate in the contested space domain. RDT&E			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206425SF *I Space Situation Awareness Systems*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. ***FY 2022 Plans:*** The DARC Site 1 competitive development contract award moved from FY 2021 to FY 2022 in order to complete technology maturation and risk reduction efforts. Slight delay in development contract award is not expected to impact timely funding execution nor anticipated 2025 delivery of Site 1 capability. Complete source selection and award contract for Site 1 design, development and build. Begin Site 1 design and development activities, including hardware purchases, initiate software development and integration, and conduct Design Reviews to support the build of the operational system. Award contracts for continuous third-party mission software development. Continue to negotiate host nation agreements with Pacific and European partners, finalize agreement with Pacific partner. Conduct environmental assessment for Site 1. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase from FY 2021 to FY 2022 is for award of the DARC Site 1 Rapid Prototype design, development and build contracts.			
Accomplishments/Planned Programs Subtotals	-	33.359	123.262

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

Project utilizes existing DoD engineering and study contracts and activities to conduct science and technology development and data analysis activities. Preliminary/ critical design effort for the technology maturation and prototype commenced in FY 2017. A Broad Agency Announcement (BAA) was used to award seven Integrated System Engineering Team (ISET) contracts which allow for organizations to participate, advise the government, and gain insight into the prototype design and build. In May of 2019, DARC was designated as an MTA under Section 804 of the 2016 National Defense Authorization Act (NDAA). In 2020, DARC was directed to pursue

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206425SF *I Space Situation Awareness Systems*

a Rapid Prototyping Middle Tier Acquisition program for Site 1. The DARC Site effort will be executed through two separate contract elements: The Prime System Integrator (PSI) will be acquired via a single, competitive award through the Space Enterprise Consortium (SpEC) Other Transaction Authority (OTA) agreement and third-party software development through multiple SpEC OTA agreements. The Space Force intends to develop and field two additional DARC sites in the future to culminate in a final operational system of three global sites to ensure SDA coverage. A follow-on MTA pathway strategy based on the success of the Site 1 rapid prototype will be developed later for Sites 2 and 3 in accordance with DoDI 5000.80.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206425SF / *Space Situation Awarenes s Systems*	Project (Number/Name) 640290 / *Deep Space Advanced Radar Concept*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DARC Non-Recurring Engineering (NRE)/ Advanced Hardware Purchase	Various	Various : TBD	-	-		24.245	Mar 2021	60.319	Jan 2022	-		60.319	-	-	-
DARC Site 1 Capability	TBD	TBD : TBD	-	-		-		45.297	Mar 2022	-		45.297	-	-	-
		Subtotal	-	-		24.245		105.616		-		105.616	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DARC Prototype System and Sustainment Analyses	Various	Various : TBD	-	-		0.150	Mar 2021	0.150	Mar 2022	-		0.150	-	-	-
		Subtotal	-	-		0.150		0.150		-		0.150	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	Various : TBD	-	-		5.134	Jun 2021	14.371	Nov 2021	-		14.371	-	-	-
FFRDC	RO	MITRE Corp. : Colorado Springs, CO	-	-		3.730	Nov 2020	2.925	Nov 2021	-		2.925	-	-	-
Other Support	Various	Various : Colorado Springs, CO	-	-		0.100	Nov 2020	0.200	Nov 2021	-		0.200	-	-	-
		Subtotal	-	-		8.964		17.496		-		17.496	-	-	N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		33.359		123.262		-		123.262	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206425SF / *Space Situation Awarenes s Systems*	Project (Number/Name) 640290 / *Deep Space Advanced Radar Concept*	

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

The DARC project has minimal organic resources. The FY 2022 increase in Management Services is due to parallel efforts to finalize international agreements, complete source selection, award the Site 1 contract, begin development work on Site 1, prepare for and execute design reviews and begin preparations for Site 2 and Site 3 development activities.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206425SF / *Space Situation Awarenes s Systems*	**Project (Number/Name)** 640290 / *Deep Space Advanced Radar Concept*

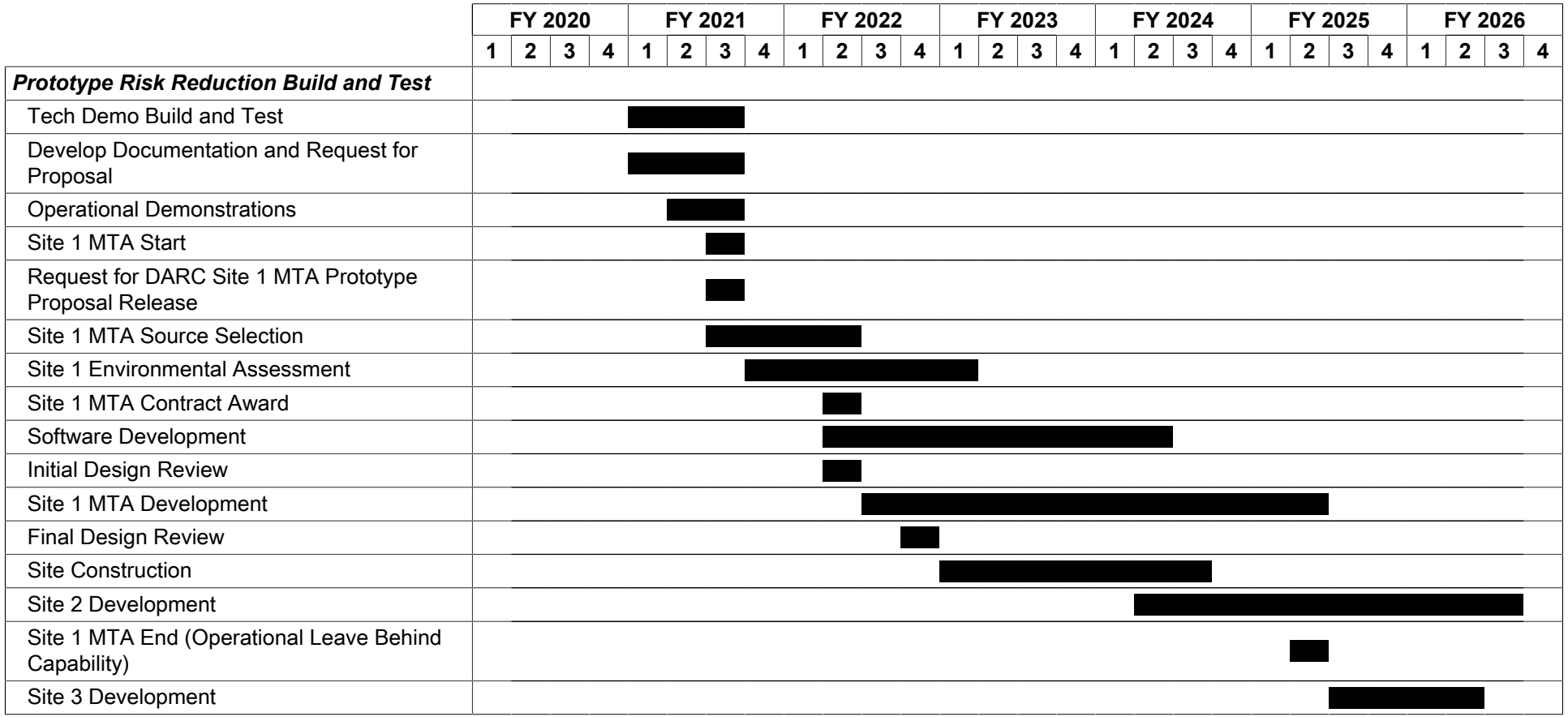

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206425SF / *Space Situation Awarenes s Systems*	**Project (Number/Name)** 640290 / *Deep Space Advanced Radar Concept*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Prototype Risk Reduction Build and Test				
Tech Demo Build and Test	1	2021	3	2021
Develop Documentation and Request for Proposal	1	2021	3	2021
Operational Demonstrations	2	2021	3	2021
Site 1 MTA Start	3	2021	3	2021
Request for DARC Site 1 MTA Prototype Proposal Release	3	2021	3	2021
Site 1 MTA Source Selection	3	2021	2	2022
Site 1 Environmental Assessment	4	2021	1	2023
Site 1 MTA Contract Award	2	2022	2	2022
Software Development	2	2022	2	2024
Initial Design Review	2	2022	2	2022
Site 1 MTA Development	3	2022	2	2025
Final Design Review	4	2022	4	2022
Site Construction	1	2023	3	2024
Site 2 Development	2	2024	3	2026
Site 1 MTA End (Operational Leave Behind Capability)	2	2025	2	2025
Site 3 Development	3	2025	2	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206427SF *I Space Systems Prototype Transitions (SSPT)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	151.595	101.851	0.000	101.851	-	-	-	-	-	-
645601: *Space Defense Capabilities*	-	0.000	151.595	96.851	0.000	96.851	-	-	-	-	-	-
645611: *Assault Breaker II*	-	0.000	0.000	5.000	0.000	5.000	-	-	-	-	-	-

Note

This program, BA 4, PE 1206427SF, project , Assault Breaker II, is a new start.

A. Mission Description and Budget Item Justification

The Space System Prototype Transition (SSPT) Program will identify and address space technology and capability gaps in order to facilitate technology transition to military space prototypes and programs of record. It will conduct a wide array of activities to model, integrate, test, and provide launch integration and support on-orbit testing of prototype technologies. The supported activities include: systems engineering, technology planning, development, demonstrations and testing, as well as modeling, simulations and exercises to support the development and maturation of tactics and procedures. This includes the development and prototyping of critical technology within the Department of Defense, across other government agencies, academic institutions and industry partners that are identified and the necessary systems engineering to effectively employ such systems.

Specifically the SSPT Program establishes a cost-effective framework to identify, mature and transition demonstrations and prototypes to:

-Rapidly address identified technology or capability gaps
-Accelerate the maturation of systems intended for demonstrations/prototypes that enhance/compliment/replace an existing capability
-Support a more reliable, available, maintainable and survivable military space enterprise
-Energize the space industrial base supporting U.S. national security
-Focus S&T Innovation and facilitate its transition to military space programs of record

This program includes projects for Long Duration Propulsive Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) (LDPE) and its follow-on activities called Rapid On-Orbit Space Technology Evaluation Ring (ROOSTER), Tetra, Blackjack, and Quasi-Zenith Satellite System (QZSS)-Hosted Payload (HP):

LDPE and ROOSTER provide a low-cost, rapid, and flexible on-orbit capability to host and deploy numerous prototypes and payloads utilizing excess payload margin available on US Space Force (USSF) launch missions. Each LDPE/ROOSTER on-orbit platform is currently designed to fly multiple payloads per mission, thus fully utilizing launch potential and providing the only recurring rideshare option for prototypes and experiments to geosynchronous orbit. The LDPE acquisition baseline includes the following mission scope: LDPE-1, -2 and -3a. All missions beyond LDPE-3a are planned as part of ROOSTER activities. The objectives of the ROOSTER project are to rapidly and cost-effectively enable on-orbit checkout and testing of prototypes and experimental payloads and to mature operational concepts and Techniques, Tactics and Procedures (TTPs) for future use in the USSF space enterprise architecture.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206427SF *I Space Systems Prototype Transitions (SSPT)*

Tetra is a project that will provide a training platform for operators to develop and demonstrate TTPs for pathfinder mission sets. This project directly supports the evolution of operations to include space situational awareness and control.

Blackjack is a joint technology demonstration project led by DARPA and the Space Force to evaluate military utility and concepts of operation for a Proliferated Low Earth Orbit (P-LEO) satellite constellation. The project leverages industry innovation in commercial P-LEO concepts by integrating military payloads onboard commercial commoditized satellite vehicles, demonstrating onboard data processing and autonomous tasking, and transmitting encrypted data through a mesh network of satellites in LEO with the goals of augmenting existing warfighter capability, increasing national security space resiliency, and decreasing per-unit satellite costs.

QZSS-HP is a "pacesetter" hosted payload that is a high priority for the U.S. and Japan, paving the way for future Allied collaborations. It enhances Geostationary Earth Orbit (GEO) Space Domain Awareness (SDA) capabilities over the Eurasian theater and facilitates resilient capabilities in the Space Surveillance Network (SSN).

MASE effort will demonstrate mature space environment technology to improve combat operations. MASE will enhance regional ionospheric specification (nowcasts) and predictions (forecasts) affecting signal propagation paths. MASE uses traditional and non-traditional ionospheric measurements in advanced space environment models to forecast and predict impacts to weapon systems. It contributes to satisfying Gaps 4 and 7 of the Space-Based Environment Monitoring (SBEM) requirements due to Congressional direction to fix an appropriation error.

Assault Breaker II is a program led by DARPA that provides the "technical underpinning" for multi-domain operations and counter anti-access, area-denial strategies; further details are classified.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SSPT capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

The FY 2022 funding request was reduced by 14.154 million to account for the availability of prior year execution balances.

FY 2022 funding totals include 11.900 requested for the Pacific Defense Initiative.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206427SF *I Space Systems Prototype Transitions (SSPT)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	142.808	100.265	0.000	100.265
Current President's Budget	0.000	151.595	101.851	0.000	101.851
Total Adjustments	0.000	8.787	1.586	0.000	1.586
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	8.787			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	1.586	0.000	1.586

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 645601: *Space Defense Capabilities*		
Congressional Add: *Military Application of the Space Environment (MASE)*	0.000	8.787
Congressional Add Subtotals for Project: 645601	0.000	8.787
Congressional Add Totals for all Projects	0.000	8.787

Change Summary Explanation

FY 2021: +$8.787M; Funds for MASE were transferred from Appropriation 3600, Research, Development, Test & Evaluation, Air Force, PE 1206422F.
FY 2022: +$11.900M; Fund QZSS-HP to Single Best Estimate (SBE).
FY 2022: +$5.000M; Fund for DARPA led Assault Breaker II program.
FY 2022: -$14.154M; Due to execution.
FY 2022: -$1.160M; Due to inflation adjustments

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	Project (Number/Name) 645601 / *Space Defense Capabilities*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
645601: *Space Defense Capabilities*	-	0.000	151.595	96.851	0.000	96.851	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Space System Prototype Transition (SSPT) Program will identify and address space technology and capability gaps in order to facilitate technology transition to military space prototypes and programs of record. It will conduct a wide array of activities to model, integrate, test, and provide launch integration and support on-orbit testing of prototype technologies. The supported activities include: systems engineering, technology planning, development, demonstrations and testing, as well as modeling, simulations and exercises to support the development and maturation of tactics and procedures. This includes the development and prototyping of critical technology within the Department of Defense, across other government agencies, academic institutions and industry partners that are identified and the necessary systems engineering to effectively employ such systems.

Specifically the SSPT Program establishes a cost-effective framework to identify, mature and transition demonstrations and prototypes to:

-Rapidly address identified technology or capability gaps
-Accelerate the maturation of systems intended for demonstrations/prototypes that enhance/compliment/replace an existing capability
-Support a more reliable, available, maintainable and survivable military space enterprise
-Energize the space industrial base supporting U.S. national security
-Focus S&T Innovation and facilitate its transition to military space programs of record

This program includes projects for Long Duration Propulsive Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) (LDPE) and its follow-on activities called Rapid On-Orbit Space Technology Evaluation Ring (ROOSTER), Tetra, Blackjack, and Quasi-Zenith Satellite System (QZSS)-Hosted Payload (HP):

LDPE and ROOSTER provide a low-cost, rapid, and flexible on-orbit capability to host and deploy numerous prototypes and payloads utilizing excess payload margin available on US Space Force (USSF) launch missions. Each LDPE/ROOSTER on-orbit platform is currently designed to fly multiple payloads per mission, thus fully utilizing launch potential and providing the only recurring rideshare option for prototypes and experiments to geosynchronous orbit. The LDPE acquisition baseline includes the following mission scope: LDPE-1, -2 and -3a. All missions beyond LDPE-3a are planned as part of ROOSTER activities. The objectives of the ROOSTER project are to rapidly and cost-effectively enable on-orbit checkout and testing of prototypes and experimental payloads and to mature operational concepts and Techniques, Tactics and Procedures (TTPs) for future use in the USSF space enterprise architecture.

Tetra is a project that will provide a training platform for operators to develop and demonstrate TTPs for pathfinder mission sets. This project directly supports the evolution of operations to include space situational awareness and control.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645601 / *Space Defense Capabilities*

Blackjack is a joint technology demonstration project led by DARPA and the Space Force to evaluate military utility and concepts of operation for a Proliferated Low Earth Orbit (P-LEO) satellite constellation. The project leverages industry innovation in commercial P-LEO concepts by integrating military payloads onboard commercial commoditized satellite vehicles, demonstrating onboard data processing and autonomous tasking, and transmitting encrypted data through a mesh network of satellites in LEO with the goals of augmenting existing warfighter capability, increasing national security space resiliency, and decreasing per-unit satellite costs.

QZSS-HP is a "pacesetter" hosted payload that is a high priority for the U.S. and Japan, paving the way for future Allied collaborations. It enhances Geostationary Earth Orbit (GEO) Space Domain Awareness (SDA) capabilities over the Eurasian theater and facilitates resilient capabilities in the Space Surveillance Network (SSN).

MASE effort will demonstrate mature space environment technology to improve combat operations. MASE will enhance regional ionospheric specification (nowcasts) and predictions (forecasts) affecting signal propagation paths. MASE uses traditional and non-traditional ionospheric measurements in advanced space environment models to forecast and predict impacts to weapon systems. It contributes to satisfying Gaps 4 and 7 of the Space-Based Environment Monitoring (SBEM) requirements due to Congressional direction to fix an appropriation error.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SSPT capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

The FY 2022 funding request was reduced by $14.154 million to account for the availability of prior year execution balances.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Technology Maturation and Prototype Development	-	36.011	61.699	-	61.699
Description: Plan, develop, test and transition advanced technologies into space system prototypes and capabilities to meet known and emerging threats. Conduct architecture studies, modeling and simulation, technical development, integration and test activities in preparation for transition of critical technologies into prototypes or space programs of record. Develop advanced capabilities for rapid prototyping and integration into space system programs of record and, if requested, to war-fighter Urgent Operational Needs (UONs) and Joint Urgent Operational Needs (JUONs). Develop, test and integrate on-orbit platforms for checkout and testing of prototypes and experimental payloads to mature operational concepts and TTPs for future use in the USSF space enterprise architecture. Provide rideshare platform hosting opportunities to geosynchronous orbit.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645601 / *Space Defense Capabilities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
FY 2021 Plans: Continue prototype/technology developments across multiple mission areas, including but not limited to: -Tetra: Continue development of Tetra-3 and Tetra-4 prototypes to support experimentation and TTP development at GEO. -Blackjack: Continue technical analysis, design, development, test, integration and delivery of prototype, cyber, ground and data processing architecture as well as develop concepts of operations to support Command and Control (C2) system integration. -QZSS-HP development (International Cooperation): Continue design, development, build and test of two Hosted Payload Interface Unit and two SDA sensors for integration into two payloads intended for hosting on two Japanese Quasi-Zenith Satellites. -Pursue technology investment to support the space enterprise investment strategy; commercial and allied opportunities, cross-mission proliferated payloads and buses, C2 dynamic tasking, orbital maneuver, alternative orbits, dynamic communication networks, agile signal capable terminals and fighting Position, Navigation and Timing (PNT) and Satellite Communication (SATCOM), etc. -Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.					
FY 2022 Base Plans: Continue prototype/technology developments across multiple mission areas, including but not limited to: -ROOSTER: Continue risk-reduction, technical analysis, and technology maturation efforts on a propulsive multi-mission payload adapter ring and components to inform ROOSTER prototype requirements and design in order to reduce cost per ring, shorten payload integration timeline, and enable flexible swap of prototype and demonstration payload. -Tetra: Continue development of Tetra-3 prototype to support experimentation and TTP development at GEO. Deliver Tetra-3 for launch. Award the development of Tetra-5 prototype. -Blackjack: Complete integration and delivery of prototype, cyber, ground and data processing architecture as well as develop concepts of operations to support C2 system integration. -QZSS-HP development (International Cooperation): Complete development, and begin build and test of two SDA sensors intended for hosting on two Japanese Quasi-Zenith Satellites. -Pursue technology investment to support the space enterprise investment strategy: commercial and allied opportunities; cross mission data transport, proliferated payloads and buses; orbital maneuver; alternative orbits; dynamic communication networks; and Fighting PNT and SATCOM, etc.					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645601 / *Space Defense Capabilities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
-Additionally, FY2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 Increased compared to FY 2021 due to the addition of ROOSTER technology maturity activities, Tetra-5 development, and QZSS-HP delivery to Japan.					
Title: Prototype Integration, Test and On-Orbit Prototype Demonstration ***Description:*** Provide rideshare opportunities for prototypes and experiments, fund mission-unique payload integration to the rideshare or launch system, and conduct launch base integration, testing and launch operations. Conduct prototype integration and testing into the designated Command and Control system and provide operational support to conduct prototype testing, demonstration and operations. ***FY 2021 Plans:*** -Tetra: Continue payload integration and testing support for Tetra-1 and Tetra 2. Perform on-orbit demonstrations, operations and provide reach back support for Tetra-1 and Tetra-2. Provide payload integration and testing for Tetra-3 and Tetra-4. -Blackjack: Conduct technical reviews, integration and testing of prototypes with launch vehicle in support of launch and on-orbit demonstrations. Begin integration of fully assembled and tested Blackjack satellites with launch vehicles, launch the first two satellites into LEO, and conduct early orbit testing and demonstration. -QZSS-HP development (International Cooperation): Continue conducting technical reviews, integration and testing of prototypes with launch vehicle in support of two launch and on-orbit demonstrations. ***FY 2022 Base Plans:*** -ROOSTER: Perform evaluations in preparation for and award contract for ROOSTER platforms as a follow-on to LDPE-3A. Begin fabrication, assembly, and payload integration of the first ROOSTER platform to support FY 2024 launch and execution of on-orbit operations of prototype and technology demonstration payloads. Begin associated ground segment and early payload integration risk reduction efforts. -Tetra: Perform on-orbit demonstrations, operations and provide reach back support for Tetra-1 and Tetra-2. Provide satellite, payload and LDPE integration, and testing for Tetra-3 and Tetra-4. Provide launch and on-orbit operations for Tetra-3. -Blackjack: Deliver remaining flight hardware for assembly, integration, and test and provide technical reach back engineering during on-orbit demonstration activities. Conduct technical reviews, integration and testing of	-	62.420	14.572	-	14.572

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645601 / *Space Defense Capabilities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
prototypes with launch vehicle in support of launch and on-orbit demonstrations. Continue integration of fully assembled and tested Blackjack satellites with launch vehicles, launch the remaining satellites into LEO to complete the constellation, and conduct early orbit testing and demonstration. -QZSS-HP (International Cooperation): Start integration and testing of hosted payload prototypes with Japan's QZSS satellite buses and launch vehicles in support of the Quasi-Zenith Satellite 6 launch in FY 2023. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to completion of Tetra-1 and Tetra-2, near completion of Blackjack efforts, and moving the QZSS-HP development efforts to the Technology Maturation and Prototype Development thrust.					
Title: Long Duration Propulsive ESPA (LDPE) ***Description:*** The LDPE platform provides a standard rideshare service for a wide variety of secondary payload options. It features 6 ports and accommodates ten to twelve fixed and/or separable prototype payloads. After the forward payload separates, the LDPE platform separates and propels to mission orbit, typically GEO, approximately 22,000 miles above the earth. The LDPE platform can maneuver to allow prototype/experimental payloads to be dropped off at different locations or remain hosted to the ring based on mission requirements. ***FY 2021 Plans:*** -LDPE-1: Complete payload integration, launch site planning and processing and ground development. Begin on-orbit operations. -LDPE-2: Begin on-orbit operations. -LDPE-3A: Continue payload integration, launch support, CONOPS and mission planning. Begin ground development. -ROOSTER: Begin design and assembly to support on-orbit technology demonstration and prototypes beyond LDPE-3A. Begin preparation for integration and testing of payload providers and pre-launch support. ***FY 2022 Base Plans:*** Conduct LDPE-1 & 2 on-orbit test and demonstration to enable technology maturation of the platform and prototype/experimental payloads. Continue planned 12-month execution of LDPE-1 & LDPE-2 on-orbit prototype testing, demonstration, and operational support for LDPE hosted payloads. Finalize LDPE-3A mission payload integration/test and ground development while initializing launch site processing and operational	-	44.377	20.580	-	20.580

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
readiness campaign. Support launch of LDPE-3A and begin the planned 12-month on-orbit prototype testing and demonstration phase. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to moving the ROOSTER effort to the Technology Maturation and Prototype Development and the Prototype Integration, Test and On-Orbit Prototype Demonstration thrusts.					
Accomplishments/Planned Programs Subtotals	-	142.808	96.851	-	96.851

	FY 2020	FY 2021
Congressional Add: Military Application of the Space Environment (MASE)	0.000	8.787
FY 2020 Accomplishments: N/A ***FY 2021 Plans:*** Conduct mission engineering and adapt the system to respond to evolving theater specific threats. Continue to conduct studies and perform technical analysis for external data sources and system integration, optimal sensor laydown, and system development. Continue to enhance and improve models and prototype algorithms while maintaining cybersecurity compliance. Conduct field campaigns to validate scientific algorithms, optimize cloud services, and evaluate space environment sensors. Improve system resilience and operational availability by implementing fault tolerant cloud infrastructure. Activities may include but are not limited to program office support, studies, technical analysis, experimentation, prototyping, operational testing and participation/integration into joint warfighting exercises.		
Congressional Adds Subtotals	0.000	8.787

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

All contracts funded in this program element will be awarded using competitive procedures to the maximum extent possible. The SSPT program consists of numerous projects in which the program office will leverage rapid prototyping authorities to the maximum extent possible.

In May 2019 the first three LDPE systems were awarded competitively. Air Force Research Laboratory (AFRL) required LDPE-3 to support its mission, so the LDPE Acquisition Strategy was amended to add LDPE-3A. LDPE-3A was justified to be awarded sole source as an option to the existing contract. LDPE is an ACAT III

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645601 / *Space Defense Capabilities*

program. The acquisition strategy is in coordination for the follow-on effort to LDPE, called ROOSTER, and ROOSTER platforms are expected to be competitively awarded.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	Project (Number/Name) 645601 / *Space Defense Capabilities*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
LDPE-1, 2 & 3A Launch Vehicle Integration & Ops	C/CPAF	Northrop Grumman Inno Sys : TBD	-	-		16.270	Apr 2021	13.427	Jan 2022	-		13.427	-	-	-
LDPE-2, 3A & ROOSTER Launch Support Activities	C/CPAF	Various : Various : TBD	-	-		-		5.669	Jan 2022	-		5.669	-	-	-
LDPE-3A Development	C/FFP	Northrop Grumman Inno Sys : TBD	-	-		10.000	Apr 2021	-		-		-	-	-	-
ROOSTER Development	C/FFP	TBD : TBD : TBD	-	-		15.000	Jan 2021	15.773	Jan 2022	-		15.773	-	-	-
Tetra 3 & 4 Development	C/CPFF	York Space Systems : CO : TBD	-	-		2.916	Nov 2020	2.076	Jan 2022	-		2.076	-	-	-
Tetra 5 Development	C/FFP	TBD : TBD : TBD	-	-		7.783	Apr 2021	10.549	Mar 2022	-		10.549	-	-	-
Tetra-1,2 & 3 Prototype Integration, Test & On-Orbit Prototype Demonstration	C/CPFF	Various : Various : TBD	-	-		5.729	Nov 2020	3.967	Jan 2022	-		3.967	-	-	-
Tetra-1 , 2, 3 & 4 Payload Integration into LDPE/ ROOSTER Ring	C/CPAF	Various : Various : TBD	-	-		-		0.018	Jan 2022	-		0.018	-	-	-
Blackjack Development	MIPR	Various : Various : TBD	-	-		11.248	Nov 2020	-		-		-	-	-	-
Blackjack Assembly, Integration & Test	MIPR	Various : Various : TBD	-	-		-		5.088	Jan 2022	-		5.088	-	-	-
Blackjack Launch/Support Activities	MIPR	Various : Various : TBD	-	-		47.756	Nov 2020	9.150	Jan 2022	-		9.150	-	-	-
QZSS-HP Development	Various	Various : Various : TBD	-	-		3.055	Nov 2020	14.578	Oct 2021	-		14.578	-	-	-
QZSS-HP Launch Support Activities	Various	Various : Various : TBD	-	-		8.935	Nov 2020	0.917	Apr 2022	-		0.917	-	-	-
Technical Mission Analysis	Various	Various : Various : TBD	-	-		-		5.554	Jan 2022	-		5.554	-	-	-
Military Application of the Space Environment (MASE)	TBD	Not specified. : TBD	-	-		8.787		-		-		-	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	Project (Number/Name) 645601 / *Space Defense Capabilities*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	-	-		137.479		86.766		-		86.766	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Various : Various : TBD	-	-		6.800	Jan 2021	3.836	Jan 2022	-		3.836	-	-	-
A&AS	Various	Various : Various : TBD	-	-		6.846	Feb 2021	5.763	Nov 2021	-		5.763	-	-	-
Other Support	Various	Various : Various : TBD	-	-		0.470	Oct 2020	0.486	Nov 2021	-		0.486	-	-	-
		Subtotal	-	-		14.116		10.085		-		10.085	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		151.595		96.851		-		96.851	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645601 / *Space Defense Capabilities*

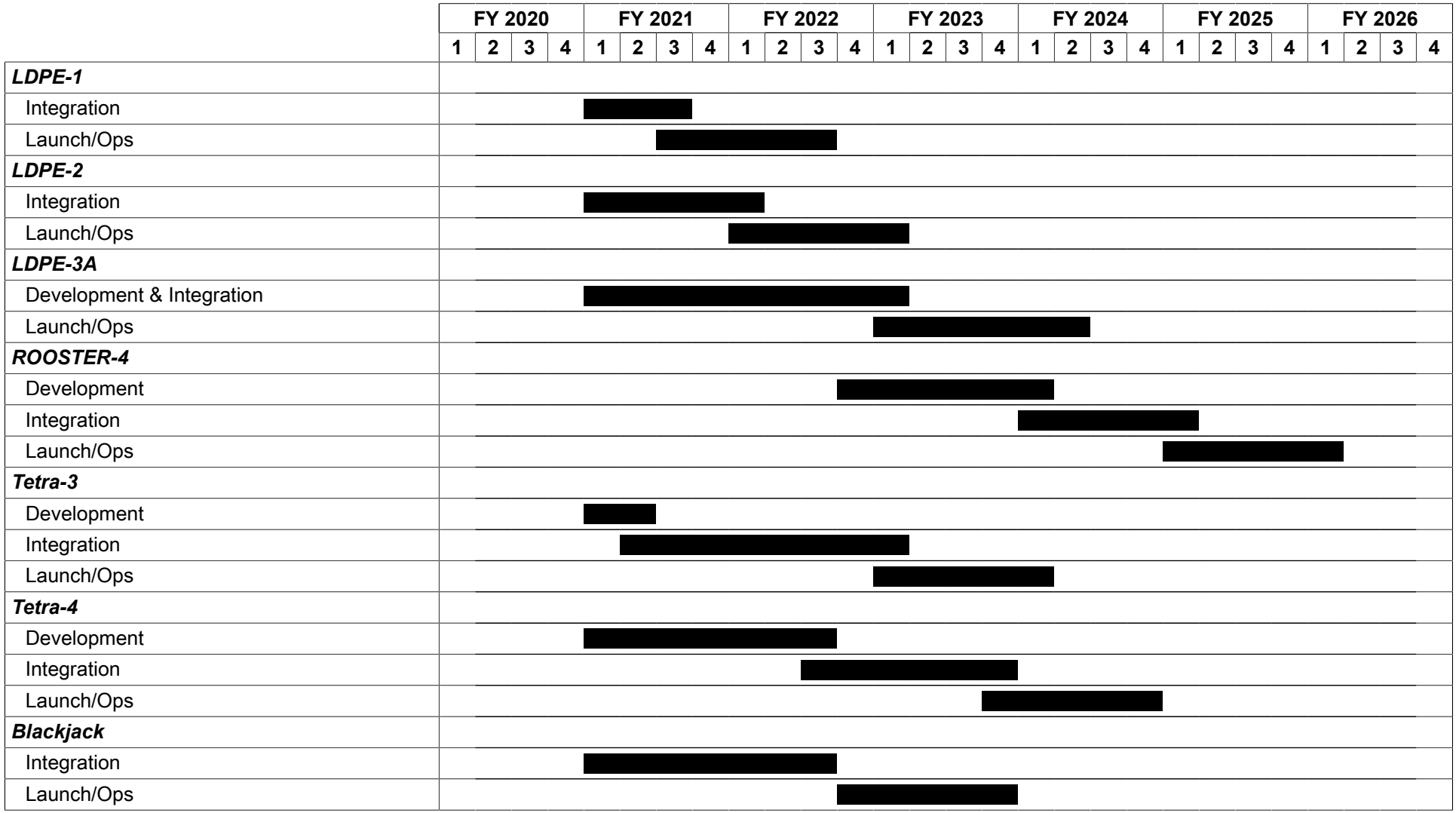

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645601 / *Space Defense Capabilities*

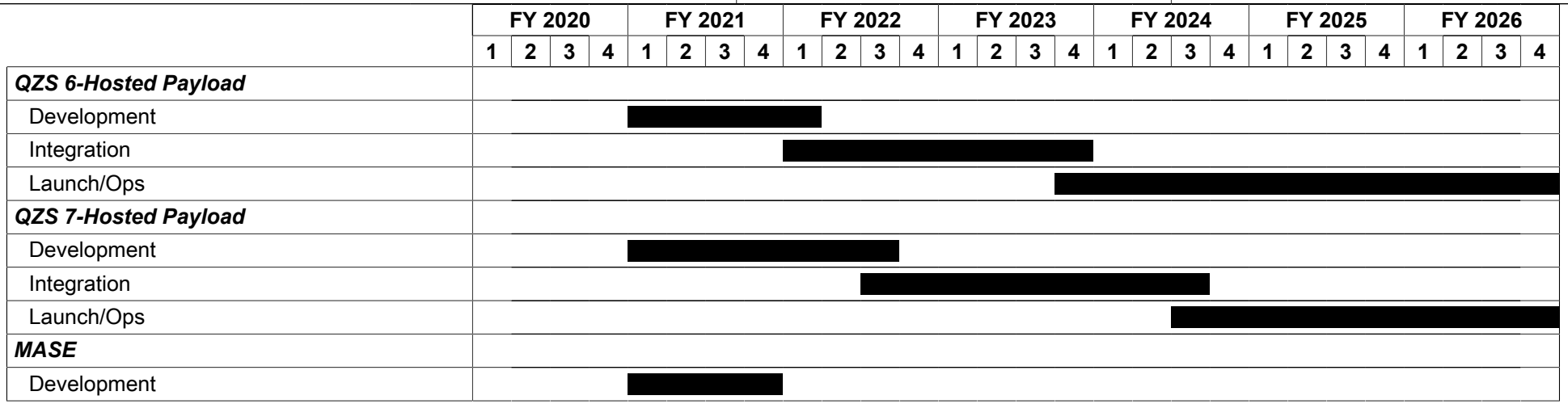

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645601 / *Space Defense Capabilities*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
LDPE-1				
Integration	1	2021	3	2021
Launch/Ops	3	2021	3	2022
LDPE-2				
Integration	1	2021	1	2022
Launch/Ops	1	2022	1	2023
LDPE-3A				
Development & Integration	1	2021	1	2023
Launch/Ops	1	2023	2	2024
ROOSTER-4				
Development	4	2022	1	2024
Integration	1	2024	1	2025
Launch/Ops	1	2025	1	2026
Tetra-3				
Development	1	2021	2	2021
Integration	2	2021	1	2023
Launch/Ops	1	2023	1	2024
Tetra-4				
Development	1	2021	3	2022
Integration	3	2022	4	2023
Launch/Ops	4	2023	4	2024
Blackjack				

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645601 / *Space Defense Capabilities*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Integration	1	2021	3	2022
Launch/Ops	4	2022	4	2023
QZS 6-Hosted Payload				
Development	1	2021	1	2022
Integration	1	2022	4	2023
Launch/Ops	4	2023	4	2026
QZS 7-Hosted Payload				
Development	1	2021	3	2022
Integration	3	2022	3	2024
Launch/Ops	3	2024	4	2026
MASE				
Development	1	2021	4	2021

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	Project (Number/Name) 645611 / *Assault Breaker II*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
645611: *Assault Breaker II*	-	0.000	0.000	5.000	0.000	5.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 4, PE 1206427SF, project , Assault Breaker II, is a new start.

A. Mission Description and Budget Item Justification

Assault Breaker II is a program led by DARPA that provides the "technical underpinning" for multi-domain operations and counter anti-access, area-denial strategies; further details are classified.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Assault Breaker II	-	0.000	5.000	0.000	5.000
Description: Assault Breaker II is a program led by DARPA that provides the "technical underpinning" for multi-domain operations and counter anti-access, area-denial strategies. Further details are classified and available upon request. ***FY 2021 Plans:*** Classified details available upon request. ***FY 2022 Base Plans:*** Classified details available upon request. ***FY 2022 OCO Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 budget increased compared to FY 2021 as detailed above.					
Accomplishments/Planned Programs Subtotals	-	0.000	5.000	0.000	5.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645611 / *Assault Breaker II*

D. Acquisition Strategy

Funds are sent to DARPA via a Military Interdepartmental Purchase Request (MIPR).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645611 / *Assault Breaker II*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Assault Breaker II	MIPR	Various : TBD	-	-		-		5.000	Dec 2021	-		5.000	-	-	-
		Subtotal	-	-		-		5.000		-		5.000	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		5.000		-		5.000	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645611 / *Assault Breaker II*

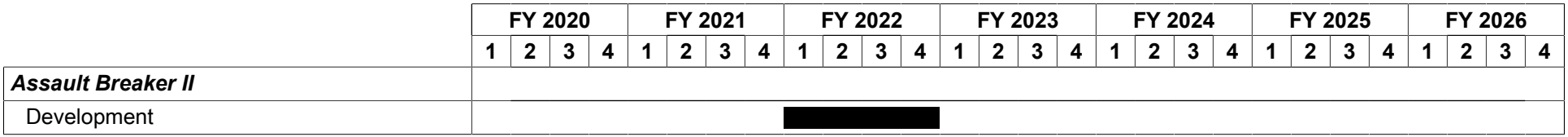

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206427SF / *Space Systems Prototype Transitions (SSPT)*	**Project (Number/Name)** 645611 / *Assault Breaker II*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Assault Breaker II				
Development	1	2022	4	2022

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206438SF / *Space Control Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	40.575	32.931	0.000	32.931	-	-	-	-	-	-
642611: *Technology Insertion Planning and Analysis*	-	0.000	40.575	32.931	0.000	32.931	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports a range of activities including systems engineering, technology planning, development, demonstrations and prototyping, and testing, as well as modeling, simulations and exercises to support development and maturation of tactics and procedures for a responsive and resilient Space Control mission area. This includes technology development and prototyping for Defensive Counterspace (DCS) and Offensive Counterspace (OCS) and the necessary systems engineering for the warfighter to effectively employ such systems.

Specifically supported are DCS and Space Domain Awareness (SDA) activities which include developing threat warning payloads for monitoring, detecting, identifying, tracking, assessing, verifying, categorizing, and characterizing objects and events in space. Additionally, this activity supports the development of payload prototypes and space defense force packages for protecting U.S. space systems, resources, and operations from enemy attempts to negate, interfere, or destroy them.

Specific OCS activities include disruption, denial, or degradation (and associated Electronic Support) of adversary space systems which may be used for purposes hostile to U.S. national security interests. Rapid Reaction Capabilities in response to immediate warfighter needs in the Space Control mission area are developed within this program. Depending on the magnitude of Combatant Command urgent operational needs, this program may not include necessary funding for all contingency deployments. As required, necessary funding will be requested through established Joint Urgent Operational Need (JUON) and Overseas Contingency Operations (OCO) processes.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary emergent or unanticipated civilian pay expenses required to manage, execute, and deliver Space Control Technologies for emergent or unanticipated weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 69999F. In CY 0.160M was expended for civilian pay expenses in this program element.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206438SF *I Space Control Technology*

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	35.575	33.339	0.000	33.339
Current President's Budget	0.000	40.575	32.931	0.000	32.931
Total Adjustments	0.000	5.000	-0.408	0.000	-0.408
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	5.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-0.408	0.000	-0.408

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 642611: *Technology Insertion Planning and Analysis*		
Congressional Add: *NEXT-C Gridded Ion Thruster Development*	-	5.000
Congressional Add Subtotals for Project: 642611	-	5.000
Congressional Add Totals for all Projects	-	5.000

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Rapid Reaction Branch	-	22.169	18.446
Description: Develops advanced capabilities for rapid prototyping and integration into space control programs of record and, if requested, to warfighter Urgent Operational Needs (UONs) and Joint Urgent Operational Needs (JUONs). Conducts prototype capability development, testing, training and rapid transition of technology and techniques to space control systems. Sustains deployed quick reaction capabilities until transition to program of record or mission completion. ***FY 2021 Plans:*** Develop, test, train, field, transition and sustain advanced rapid reaction capabilities in response to emergent requirements from multiple Combatant Commands. Conduct initial technical development and integration activities against relevant threat systems and technologies in preparation for operational requirements. Develop and test advanced prototypes in support of activities within the Space Control Technology portfolio. Finalize development/testing of urgent/emergent operational needs using Increment			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206438SF / *Space Control Technology*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
4 Government Reference Architecture (GRA) technologies. Based on technological advances relevant to the mission area, develop, integrate and evaluate next generation capabilities into GRA Increment 5. Integrate cybersecurity constructs and controls into developmental platforms to expedite fielding. Execute field development & test activities, at all locations, to verify system performance in the operational environment. Enhance fielded rapid reaction capabilities in response to evolving threats and operator feedback. Implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/ combat range events. ***FY 2022 Plans:*** Develop, test, train, field, transition and sustain advanced rapid reaction capabilities in response to emergent requirements from multiple Combatant Commands. Conduct initial technical development and integration activities against relevant threat systems and technologies in preparation for operational requirements. Develop and test advanced prototypes in support of activities within the Space Control Technology portfolio. Based on technological advances relevant to the mission area, develop, integrate and evaluate next generation capabilities into GRA Increment 5. Develop, test, train, deliver and sustain urgent/emergent operational needs using Increment 4 or Increment 5 GRA technologies as appropriate for urgent need timelines. Integrate information assurance constructs and controls into developmental platforms to expedite fielding. Execute field development & test activities, at all locations, to verify system performance in the operational environment. Enhance fielded rapid reaction capabilities in response to evolving threats and operator feedback. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to inflation adjustments.			
Title: Warfighting and Technology Futures ***Description:*** Thrust name changed from FY21 PB version, "Space Control Technology Prototype Development" to capture overall mission and activities, this is not a new start.	-	13.406	14.485

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206438SF *I Space Control Technology*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Foundational architecture and prototype development will enable the integration, interoperability and compatibility of new Space Control Technology into space systems. Funds architecture requirements sensors and programs across the space domain and within the Space Control mission area to increase resilience capacity, horizontal integration and technology maturation. ***FY 2021 Plans:*** Create and mature systems engineering models for space control scenarios, to include but not limited to Defensive Cyber Operations for Space and On-orbit Experimentation, and consolidate separate program artifacts into an interconnected virtual representation of the enterprise. Exercise those models to determine critical paths and nodes, timing requirements, risks, and opportunities. Define and perform various systems engineering functions, tools, procedures, and best practices to accelerate acquisition of successful and affordable space systems. Conduct end-of-life, IRON JAR/Wolfsat and Army joint experiments. Perform maturation and transition of new technology, and technology needs identification, prioritization, and solution development. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2022 Plans:*** Capture OCS and DCS enterprise capabilities in digital engineering models that represent the space enterprise assets, operations, and related key performance characteristics. Exercise the digital engineering models to analyze the performance, operational capabilities, and interdependencies of space systems at the enterprise level to inform the space control mission area. Define and perform various digital engineering functions, tools, procedures, and best practices to accelerate acquisition of successful and affordable space control systems. Conduct IRON JAR space experimentation activities with programs of record and mission partners to demonstrate and evaluate space technologies, mature space operations processes, conduct operator training, develop tactics, techniques, and procedures (TTPs), and validate digital engineering models. Identify and prioritize solution development of new space technologies. FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/ combat range events, and office support etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to inflation adjustments.			
Accomplishments/Planned Programs Subtotals	-	35.575	32.931

	FY 2020	FY 2021
Congressional Add: NEXT-C Gridded Ion Thruster Development	-	5.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206438SF *I Space Control Technology*

	FY 2020	FY 2021
FY 2021 Plans: NASA Glenn Research Center (GRC) designed and qualified NASA Evolutionary Xenon Thruster-Commercial (NEXT) developmental hardware for flight hardware fabrication. The $5M in Congressional funds will continue development and test of a higher Thrust to Power (T/P) NEXT derivative, referred to as NEXT-C and intended for commercial and military applications. This will entail developing the NEXT-C electric propulsion device, the associated higher power processing unit (PPU), and the Xenon propellant feed system.		
Congressional Adds Subtotals	-	5.000

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

All contracts funded in this program element will be awarded using competitive procedures to the maximum extent possible.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206438SF / *Space Control Technology*	Project (Number/Name) 642611 / *Technology Insertion Planning and Analysis*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SCT Counterspace Technology Prototyping/ Rapid Reaction Development	Various	Various : Various	-	-		20.610	Oct 2020	16.723	Oct 2021	-		16.723	-	-	-
SCT Warfighting and Technology Futures	C/FFP	TBD : El Segundo, CA	-	-		13.406	Dec 2020	13.608	Nov 2021	-		13.608	-	-	-
SCT Congressional Add	TBD	NASA : Cleveland, OH	-	-		5.000	Aug 2021	-		-		-	-	-	-
		Subtotal	-	-		39.016		30.331		-		30.331	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	Various : Various, CA	-	-		1.559	Jan 2021	2.600	Jan 2022	-		2.600	-	-	-
		Subtotal	-	-		1.559		2.600		-		2.600	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		40.575		32.931		-		32.931	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206438SF / *Space Control Technology*	**Project (Number/Name)** 642611 / *Technology Insertion Planning and Analysis*

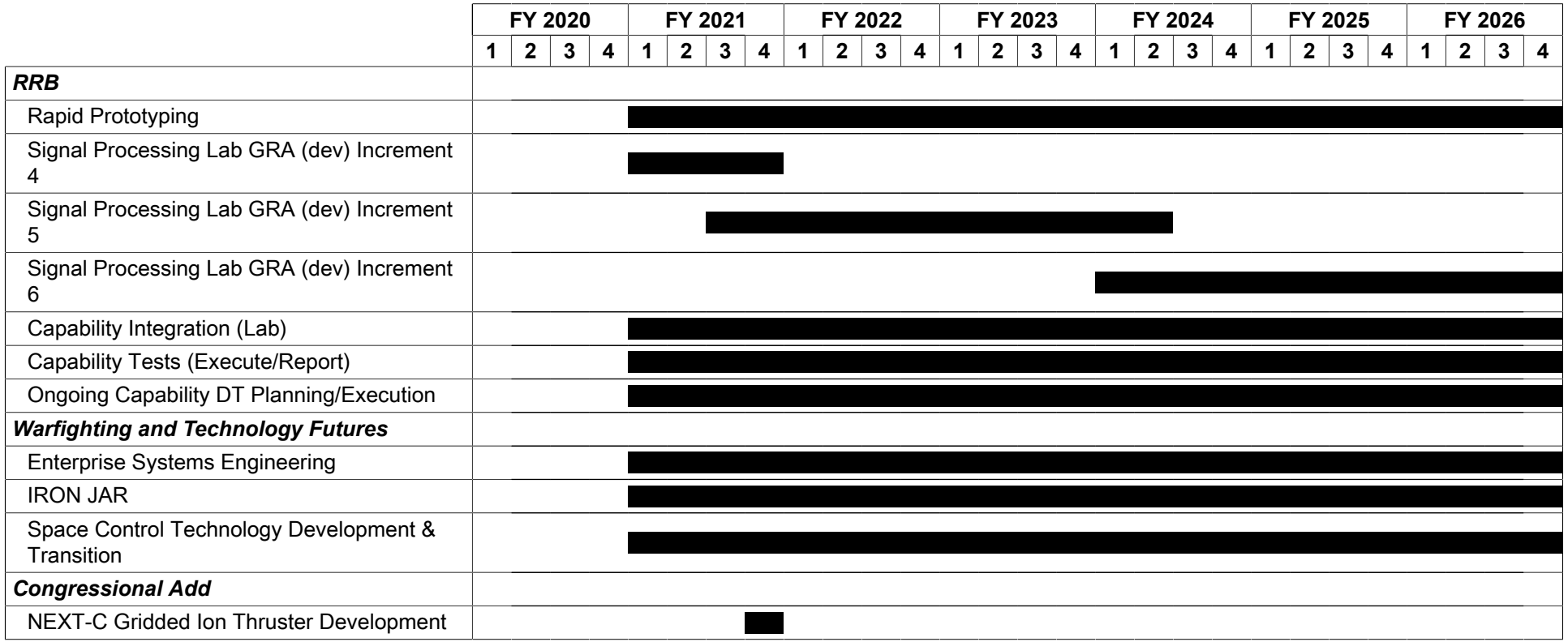

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206438SF / *Space Control Technology*	**Project (Number/Name)** 642611 / *Technology Insertion Planning and Analysis*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
RRB				
Rapid Prototyping	1	2021	4	2026
Signal Processing Lab GRA (dev) Increment 4	1	2021	4	2021
Signal Processing Lab GRA (dev) Increment 5	3	2021	2	2024
Signal Processing Lab GRA (dev) Increment 6	1	2024	4	2026
Capability Integration (Lab)	1	2021	4	2026
Capability Tests (Execute/Report)	1	2021	4	2026
Ongoing Capability DT Planning/Execution	1	2021	4	2026
Warfighting and Technology Futures				
Enterprise Systems Engineering	1	2021	4	2026
IRON JAR	1	2021	4	2026
Space Control Technology Development & Transition	1	2021	4	2026
Congressional Add				
NEXT-C Gridded Ion Thruster Development	4	2021	4	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206730SF / *Space Security and Defense Program*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	56.311	56.546	0.000	56.546	-	-	-	-	-	-
64A025: *Space Protection Program*	-	0.000	56.311	56.546	0.000	56.546	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This Program Element funds the Department of Defense (DoD)/United States Space Force (USSF) Space Security and Defense Program (SSDP). The SSDP is a Joint DoD and Office of the Director of National Intelligence (ODNI) organization established to function as the center of excellence for options and strategies (materiel, nonmateriel, cross-Title, cross-domain) leading to a more resilient and enduring National Security Space (NSS) Enterprise. The SSDP operates under the authority of the Deputy Secretary of Defense (DEPSECDEF) and Principal Deputy Director of National Intelligence (PDDNI) to lead and collaborate on space protection vulnerability, susceptibility, and mitigation assessments of NSS services for the purpose of identifying, assessing, validating and introducing protection solutions into existing requirements, budgeting and investment decision processes, informing the development of Concepts of Operations and Tactics, Techniques and Procedures (TTPs), and influencing policy along with program technical approaches. This unique mission provides an ongoing and crucial core protection competency that advances specific projects/activities (including non-kinetic techniques) to deliver comprehensive, economical and actionable solutions for both programmatic and operational domains.

The SSDP scope spans multiple space missions and stakeholders including the DoD, Intelligence Community (IC), civil, commercial, and international space entities that support NSS missions in both peacetime and throughout all phases of conflict. It is focused on being responsive to NSS stakeholders in providing technical and operational assessments of emergent threat concepts, and developing near-term and far-term plans to address architectures, strategies, threats, and vulnerabilities. SSDP Projects are structured/designed to have an impact across all time horizons; near-term focused efforts to complicate adversary operations, mid-term focused efforts to improve system and enterprise survivability, and long-term focused efforts to render adversary capabilities ineffective.

This program element may include necessary emergent or unanticipated civilian pay expenses required to manage, execute, and deliver Space Security and Defense Program for emergent or unanticipated weapon system capability.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206730SF / *Space Security and Defense Program*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	56.311	56.546	0.000	56.546
Total Adjustments	0.000	56.311	56.546	0.000	56.546
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	56.311			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	56.546	0.000	56.546

Change Summary Explanation

The three product areas described in last years R-Doc (Enterprise Capabilities & Solutions; Mission Area Protection Concepts & Architectures; and Operational Tactics, Experiments & Prototypes) are continuing in roughly the same proportions. As SSDP puts more emphasis on offensive force design and future technology architectures, bins described in this document have been altered to better reflect the portion of the architecture that will be effected in upcoming years. The new product areas are; Defend the Legacy Architecture; Develop a Resilient & Responsive Architecture; and Prepare for the Future Fight. Continuing and new SSDP projects have been re-binned into these areas.

FY 2021: Funds transferred from PE 1206730F for inclusion within Space Force portfolio.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Protection and Survivability	0.000	56.311	56.546
Description: SSDP organizes, plans, and executes specific analysis, experimentation and prototyping projects. Project prioritization and content is informed by tailored space threat characterizations, leveraging the program's extensive ties to the larger National Security Space (NSS) and Intelligence Communities (IC). These tailored characterizations are anchored to the IC's most current intelligence reporting and foundational assessments. Where gaps in available intelligence information negatively impact the ability to pursue viable solutions, SSDP expands upon existing threat information through detailed technical and operational analysis, such as to account for evolved/future threat developments, to ensure the enduring effectiveness of proposed threat mitigation solutions. The process includes decomposition of each threat to identify potential countermeasures and defeat opportunities. Projects will support development of TTPs and CONOPS for protection solutions developed by SSDP partners across the NSS Enterprise. Projects in all three areas will include non-kinetic solutions for protecting specific capabilities and the NSS Enterprise.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206730SF *I Space Security and Defense Program*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The program will accomplish these goals through in-depth technical analysis utilizing in-house high-fidelity M&S tools, physics based models, selective partnering with national labs, and advanced data studies and experimental data analytics along with other means/methods as required to deliver actionable, timely and efficient protection solutions. This deliberate variation in approach allows the program to tailor its efforts to the unique challenges and needs of each project and provide the analytical rigor essential for informing experiment/prototype selection and design to ensure the highest possible return on investment and mission impact. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** In FY22 will organize, plan and execute specific analysis, experimentation and prototyping projects in three focus areas: Defend the Legacy Architecture; Develop a Resilient & Responsive Architecture; and Prepare for the Future Fight. Projects within these focus areas are designed and proposed in response to emerging, validated adversary threats and the associated mission priorities of the DoD and IC. These efforts are responsive to the changing threat climate and will further the integration of DoD & IC space protection efforts through technical engineering-based analysis, modeling and simulation (M&S), and operator engagement by delivering targeted analysis, policy recommendations, and initiatives across the full spectrum of the program's chartered activities. The emerging SSDP focus areas reflect the evolution in the strategic thinking on Space Security by leadership in the National Security Space (NSS) enterprise. Much of this adjustment has been driven by SSDP work over the FY18 to FY20 time-frame to include the 90-Day Study, SecAF Space Strategy, and OSD requested Space Program Reviews. While particular focus areas which the projects are organized in the document have changed, the underlying intent of SSDP's activities has not changed. Therefore, all planned scope begun in FY20-FY21 will continue into the FY22 FYDP for execution in the new focus areas. The new focus areas will help convey the breadth and balance of efforts influencing the space enterprise. For FY 2022 in support of Defend the Legacy Architecture the Program will develop Tactics, Techniques and Procedures (TTPs)to take full advantage of planned and programmed future capabilities and generate necessary technical analysis to support their integration into Combatant Commander plans (once fielded). Continue to leverage its experienced analyst and mature M&S toolset to assess resiliency & proactive DSC concepts and recommend architectural and capability solutions followed by targeted experimentation & prototyping to validate analysis and recommendations. In support of the focus area to Develop a Resilient & Responsive Architecture, projects will assess outcomes of integrated space and terrestrial scenarios for a variety of architectures to understand how protection options impact the outcome of multi domain scenarios. Use M&S capability to assess the value of proposed resilient DSC and OSC architectures. Design and execute demonstrations to validate and document the changes necessary to achieve tactically relevant SSA. Provide resilience recommendations to program offices, and enterprise/system requirements definition efforts in order to align resilience strategies			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206730SF / *Space Security and Defense Program*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
with acquisition strategies. Further development of a prototyping environment to rapidly close C2 technology knowledge gaps, develop a multi-domain C2 prototype/test environment and identify/refine C2 performance metrics and standards. Deliver MOD/SIM capabilities to expand advanced concepts and to support Electronic Warfare (EW) planning in order to develop a Blue EW architecture design which emphasizes EW/RF capabilities necessary to defeat a peer adversary's capabilities and defend Blue space capabilities. Finally, the Program's Prepare for the Future Fight project goals are to provide analysis and recommendations on authorities,response options, and policy & guidance to strategic, operational & tactical level partners for the range of counter-space threats. Conduct Mission and Enterprise level architecture analysis focused on how multiple systems interact to impact the space and terrestrial campaigns. Analyze techniques for survivability through deception and non-kinetic D5M options, and explore resilience options to preserve capabilities through all phases of conflict. Utilize Wargames and game-like events to develop operational concepts at the architecture level, identify acquisition strategies to enable previously identified operational concepts, and identify gaps in current and future planned architectures to feed into future events. The end goal of these FY 22 projects is to integrate all of the analysis with results from prototyping and experimentation to build more survivable architectures. The Program's FY 2022 projects will continue to shift in the programs weight of effort from legacy systems to a focus on offensive capabilities and defining a revolutionary architecture for the future fight. As part of this shift, the Program continues to evolve its roster of protection-oriented tools, focus on policy recommendations to shape the future environment, and develop the requirements through rigorous MS&A, prototyping and experimentation necessary to deliver the next generation of resilient NSS architectures. The program will also utilize in-depth technical analysis, and M&S to deliver actionable protection solutions in response to emerging and time-sensitive high-priority DoD & IC space needs. Many of these activities will be executed with our mission partners, either in-house or in their facilities, to ensure the best application and use of toolsets, expertise and technology. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A			
Accomplishments/Planned Programs Subtotals	0.000	56.311	56.546

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206730SF *I Space Security and Defense Program*

E. Acquisition Strategy

All contracts funded in this program element will be awarded using competitive procedures to the maximum extent possible. The program consists of numerous small projects.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206730SF / *Space Security and Defense Program*	Project (Number/Name) 64A025 / *Space Protection Program*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Space Protection and Survivability	Various	Various : TBD	-	0.000		50.133	May 2021	50.315	May 2022	-		50.315	-	-	-
		Subtotal	-	0.000		50.133		50.315		-		50.315	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Support and Infrastructure	Various	Various : TBD	-	0.000		1.995	Mar 2021	2.138	Mar 2022	-		2.138	-	-	-
Oversight, Advisory and other Technical Support	Various	Various : TBD	-	0.000		4.183	Mar 2021	4.093	Mar 2022	-		4.093	-	-	-
		Subtotal	-	0.000		6.178		6.231		-		6.231	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	0.000		56.311		56.546		-		56.546	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206730SF / *Space Security and Defense Program*	**Project (Number/Name)** 64A025 / *Space Protection Program*

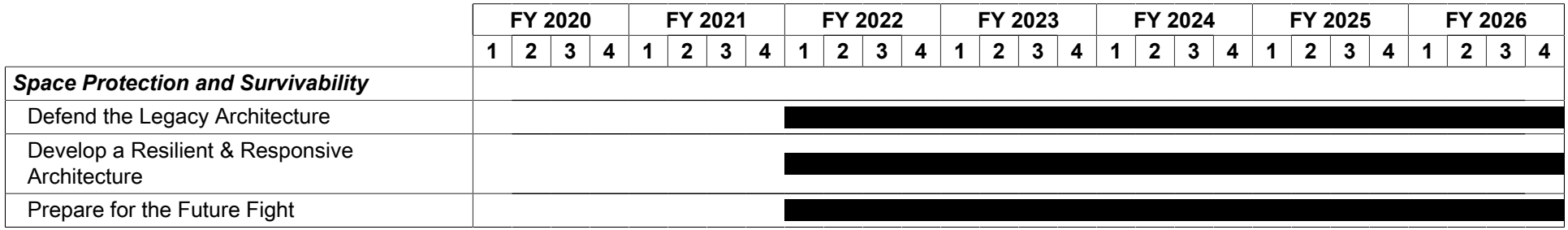

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206730SF / *Space Security and Defense Program*	**Project (Number/Name)** 64A025 / *Space Protection Program*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Space Protection and Survivability				
Defend the Legacy Architecture	1	2022	4	2026
Develop a Resilient & Responsive Architecture	1	2022	4	2026
Prepare for the Future Fight	1	2022	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	109.390	100.320	0.000	100.320	-	-	-	-	-	-
643726: *PTES*	-	0.000	109.390	100.320	0.000	100.320	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The global threat of electronic warfare attacks against space systems will expand in the coming years in both number and types of weapons. Threat development will very likely focus on jamming capabilities against dedicated military satellite communications (MILSATCOM). To address this critical threat, the Space Force is developing the Protected Tactical Enterprise Service (PTES) ground system to provide worldwide, anti-jam, Low Probability of Intercept (LPI) communications for tactical warfighters. PTES will utilize the Protected Tactical Waveform (PTW) to provide anti-jam communications via military and commercial satellite systems for tactical users in all Services. Initially, PTES will utilize the Wideband Global SATCOM (WGS) system and may be expanded later to include commercial satellites and the Protected Tactical SATCOM (PTS) system.

The PTES program is developing a Mission Management System (MMS), a Key Management System (KMS) and hub system to enable PTW via transponded WGS satellites, with future extension to commercial SATCOM. Production-representative PTW modems for user terminals were developed by the Protected Tactical Service Field Demonstration (PTSFD) and separately acquired by each Service and by international partners.

To meet the warfighter requirements for protected tactical MILSATCOM and the capability gaps identified in these studies, RDT&E funding is required for architectural development, acquisition strategy development, system requirements and system trades analysis, and engineering, manufacturing, developing, testing and evaluating PTES systems and segments.

The PTES rapid prototype addresses an urgent operational need in the Pacific region by achieving Initial Operational Capability (IOC) in 2024. IOC provides ground elements for PTW over WGS and consists of PTES installation at two WGS Gateway sites utilizing one WGS satellite. The Navy Wideband Anti-Jam Modem System (WAMS), the Air Force-Army Anti-Jam Modem (A3M), and other stakeholders rely on PTES to provide PTW ground infrastructure. The Space Force is utilizing FY 2016 National Defense Authorization Act, Section 804, Middle Tier of Acquisition for Rapid Prototyping authority to deliver a PTES Operational Demonstration meeting IOC threshold capabilities in FY 2022. At Full Operational Capability (FOC) PTES will provide worldwide PTW operations using up to all WGS satellites.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206760SF *I Protected Tactical Enterprise Service (PTES)*

The FY 2022 funding request was reduced by $1.686 million to account for the availability of prior year execution balances.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver PTES weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	114.390	103.250	0.000	103.250
Current President's Budget	0.000	109.390	100.320	0.000	100.320
Total Adjustments	0.000	-5.000	-2.930	0.000	-2.930
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-5.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-2.930	0.000	-2.930

Change Summary Explanation

FY 2021: -5.000M, Congressional Reduction for unjustified increase.

FY 2022: -1.686M to account for the availability of prior year execution balances; -$1.244M due to inflation adjustment.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: PTES Prototype Development	-	109.390	100.320
Description: After competitive contract award, the PTES team will develop a prototype consisting of three segments: a MMS, a KMS, and joint hubs integrated into existing SATCOM gateways. PTES will enable an anti-jam communications capability via PTW over WGS for tactical users in all Services and International Partners. The PTES team will be responsible for developing all PTES segments and performing all system integration, including end-to-end tests of the complete PTES prototype.			
FY 2021 Plans: Complete Agile Build 2 of the PTES Prototype Development. Continue to test and deliver MMS, KMS, and Key Loading Initialization Facility (KLIF) functionality on multiple system level integration and testing events on the Government approved			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206760SF *I Protected Tactical Enterprise Service (PTES)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Data Center environment. Conduct the Build 2 Risk Reduction Demonstration and the Risk Reduction Test on the PTES Integration, Test and Development Environment. Conduct required cybersecurity assessments and multiple requirements management framework assessments including security, adversarial, and cyber vulnerability assessments, and ground segment End Cryptographic Unit (ECU) NSA certification. Begin Build 3, which includes operational demonstration capability, and execute the Interim Program Review for Operational Demonstration Readiness on the Government approved Data Center environment. Seek to participate in various Navy operational exercise to test for interoperability of PTES system with external organization's terminal modems over WGS. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Complete Agile Build 3 and 4 of the PTES Prototype Development and commence Build 5. Conduct Operational Demonstration of PTES Minimum Viable Product. Continue to test and deliver MMS, KMS, and Key Loading Initialization Facility (KLIF) functionality on multiple system-level integration and testing events on the Government approved Data Center environment. Conduct the Build 3 Risk Reduction Test on the PTES Integration, Test and Development Environment. Continue to conduct required cybersecurity assessments and obtain cybersecurity operational Authority to Operate (ATO) and PATS Operations Center (PATSOC) Authority to Connect (ATC). Complete Joint Hub End Cryptographic Unit (ECU) NSA certification, Joint Hub Space and Missile Defense Command (SMDC) certification, and Joint Hub System Acceptance Testing (SAT). Complete KMS ECU certification. Complete interoperability certification. Rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decrease is due to completion of Build 2 activities, majority of Build 3 activities, and lead up to the operational demonstration effort completed in late FY 2021. These efforts built the foundational system architecture and was generally more complex than the close out Build 3, Build 4 and the start of Build 5.			
Accomplishments/Planned Programs Subtotals	-	109.390	100.320

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPSF 01 BA01 PTES00: *PTES HUB*	-	-	7.406	-	7.406	-	-	-	-	-	-

Remarks

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206760SF *I Protected Tactical Enterprise Service (PTES)*

E. Acquisition Strategy

PTES was designated as a rapid prototype in June 2018 under section 804 of the National Defense Authorization Act for Fiscal Year 2016 (Public Law 114-92). The objective of the PTES ground system is to provide an operational anti-jam communications capability via WGS using PTW. The PTES acquisition approach is to competitively award a single contract to develop and field PTES, through declaration of IOC. Boeing and sub-contractors will be responsible for developing all PTES segments (MMS, KMS, and Hub) and performing all system integration, including end-to-end tests of the complete PTES prototype. The 45th Test Squadron is planned to be the PTES Developmental Test organization and Air Force Operational Test and Evaluation Center (AFOTEC) is planned to be the Operational Test organization.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Protected Tactical Enterprise Service Prototype Development	C/CPIF	Boeing : El Segundo, CA	-	-		82.459	Oct 2020	72.777	Dec 2021	-		72.777	-	-	-
Data Center	Various	Various : Various	-	-		2.000	Dec 2020	3.320	Dec 2021	-		3.320	-	-	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		6.900	Nov 2020	5.848	Nov 2021	-		5.848	-	-	-
Enterprise SE&I	Various	Various : Various	-	-		10.926	Oct 2020	9.747	Dec 2021	-		9.747	-	-	-
		Subtotal	-	-		102.285		91.692		-		91.692	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test Planning & Execution DT/OT	Various	Various : Various	-	-		1.358	Dec 2020	6.340	Dec 2021	-		6.340	-	-	-
		Subtotal	-	-		1.358		6.340		-		6.340	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	MIPR	Aerospace : El Segundo, CA	-	-		0.185	Nov 2020	0.162	Nov 2021	-		0.162	-	-	-
A&AS	Various	Various : Various	-	-		5.412	Nov 2020	2.006	Nov 2021	-		2.006	-	-	-
Other Support	Various	Various : Various	-	-		0.150	Oct 2020	0.120	Nov 2021	-		0.120	-	-	-
		Subtotal	-	-		5.747		2.288		-		2.288	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		109.390		100.320		-		100.320	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	Project (Number/Name) 643726 / *PTES*	

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

N/A

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*

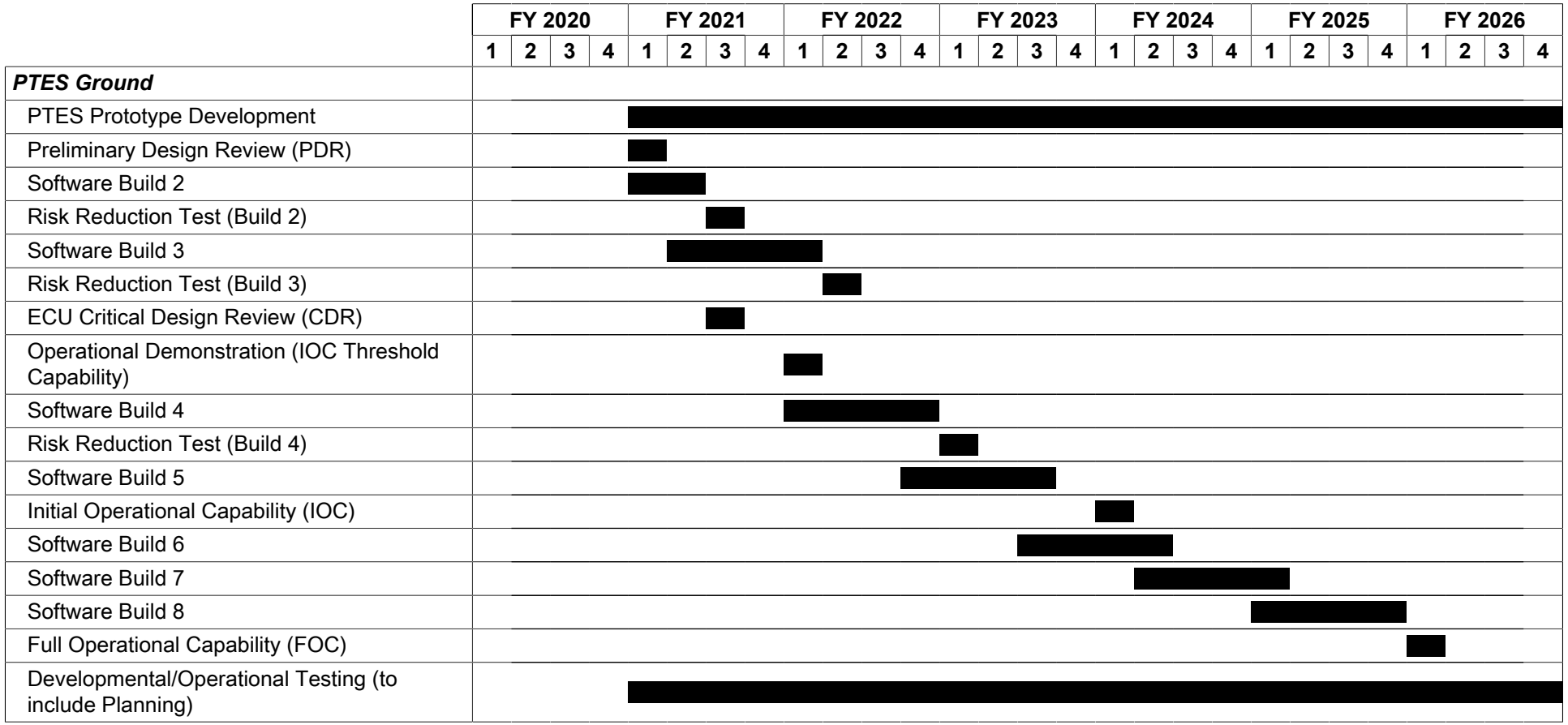

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206760SF / *Protected Tactical Enterprise Service (PTES)*	**Project (Number/Name)** 643726 / *PTES*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
PTES Ground				
PTES Prototype Development	1	2021	4	2026
Preliminary Design Review (PDR)	1	2021	1	2021
Software Build 2	1	2021	2	2021
Risk Reduction Test (Build 2)	3	2021	3	2021
Software Build 3	2	2021	1	2022
Risk Reduction Test (Build 3)	2	2022	2	2022
ECU Critical Design Review (CDR)	3	2021	3	2021
Operational Demonstration (IOC Threshold Capability)	1	2022	1	2022
Software Build 4	1	2022	4	2022
Risk Reduction Test (Build 4)	1	2023	1	2023
Software Build 5	4	2022	3	2023
Initial Operational Capability (IOC)	1	2024	1	2024
Software Build 6	3	2023	2	2024
Software Build 7	2	2024	1	2025
Software Build 8	1	2025	4	2025
Full Operational Capability (FOC)	1	2026	1	2026
Developmental/Operational Testing (to include Planning)	1	2021	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206761SF / *Protected Tactical Service (PTS)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	200.178	243.285	0.000	243.285	-	-	-	-	-	-
643728: *Protected Tactical SATCOM*	-	0.000	200.178	243.285	0.000	243.285	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The global threat of electronic warfare attacks against space systems will expand in the coming years in both number and types of weapons. Threat development will very likely focus on jamming capabilities against dedicated military satellite communications. To address this critical threat, the Space Force is developing the Protected Anti-jam Tactical Satellite Communications (PATS) family-of-systems, Protected Tactical Satellite Communications (PTS) program to mitigate adversarial jamming effects. PTS provides worldwide and polar, beyond-line-of-sight, Anti-Jam (AJ), low- probability-of intercept communications in benign and highly-contested environments utilizing the Protected Tactical Waveform (PTW). PTS, with its on-board payload processing and antenna design, enables reliable tactical satellite communications within close proximities to adversarial jammers. The system also employs interfaces consistent with United States Space Force's on-going resilience initiatives; thereby enhancing mission assurance, resiliency, and interoperability.

The Space Force is utilizing FY 2016 National Defense Authorization Act, Section 804, Middle Tier of Acquisition for Rapid Prototyping authority and Section 815, Other Transaction Authority (OTA), to achieve an affordable, rapid, operational capability for the tactical warfighter. This strategy employs spiral payload development to progressively and incrementally deploy prototypes with residual capabilities demonstrated in an operational environment. These spiral payload prototypes demonstrate innovative anti-jam technologies with modular and scalable payloads to meet validated military needs for protected tactical communications. This includes technical baseline development, systems engineering trade analyses, internal/external system integration and development, candidate system architecture evaluations, risk reduction demonstrations, prototyping concepts development, system testing, and enabling technologies maturation.

PTS includes a space segment, ground segment and gateway segment. For the space segment, the Space Force strategy utilizes a payload-centric focus to enable an affordable, resilient space architecture. This enables hosting and rideshare opportunities with other US government, commercial, International Partner satellites or integration onto a commodity satellite bus. For the ground segment, PTS leverages the Enterprise Ground Service (EGS) for satellite command and control, and the Protected Tactical Enterprise Service (PTES) rapid prototyping activity for mission and key management planning. The PTS gateway segment enables tactical warfighters reach back to global DoD Information Network. The PTS user terminal segment, not included in this PTS acquisition, will be procured by the military services utilizing low-cost PTW modem upgrades enabled by the Air Force-Army Anti-Jam Modem (A3M) ACAT III program and the Wideband Anti-Jam Modem System (WAMS) technology demonstration program.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition

authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

In FY 2022, PE 1206431SF, Advanced EHF MILSATCOM (SPACE), Protected Tactical Testbed efforts were transferred to PE 1206761SF, Protected Tactical SATCOM (PTS), in order to better align the testbed with the family of programs it will support in the Future Years Defense Program (FYDP).

This program element may include necessary civilian pay expenses required to manage, execute, and deliver PTS weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	205.178	225.186	0.000	225.186
Current President's Budget	0.000	200.178	243.285	0.000	243.285
Total Adjustments	0.000	-5.000	18.099	0.000	18.099
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-5.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	18.099	0.000	18.099

Change Summary Explanation

FY 2021: -$5M Congressional Directed Reduction for management services unjustified increase.
FY 2022: +$14.745M funds transferred from PE 1206431SF, Advanced EHF MILSATCOM to better align the Protected Tactical Testbed with the programs the testbed will support in the future; +$6.371M to support disconnect to the Service Cost Position; -$3.017M inflation adjustment.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Technical Baseline Management and System Integration	-	28.776	31.562
Description: Perform as Government system integrator function through acquiring, designing, testing, and integrating key prototype segments and interfaces. Mature technical baseline and interface requirements for the prototype system. Conduct architectural engineering and system level integration planning for the PTS space, ground, and gateway segments. Support,			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206761SF *I Protected Tactical Service (PTS)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
configure, and conduct integrated testing of the major PTS subsystems, segments, and end-to-end prototype system. Manage the PTS open system architecture, refine interface requirements, and validate concept of operations through integrated system performance demonstrations. ***FY 2021 Plans:*** Support prototype capability and interface maturity demonstrations of three contractors. Incorporate critical lessons from demonstrations into ongoing maturation and refinement of the technical baseline and system architecture, and into systems engineering trades. Continue acquiring developing and managing key system components including the prototype Ground and Gateway Segments along with their interfaces. Support PATS level integration and reduce risks to integrating with PTES and other partner programs. Conduct key interface tests between the PTS prototype and emulators/simulators to reduce risk prior to entering Build and Test phase of the payload. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Support prototype capability and interface maturity demonstrations of up to two flight prototype payloads. Iteratively incorporate critical lessons from demonstrations into maturation and refinement of the technical baseline and system architecture. Identify and mitigate program risks through the use of engineering trades, supported by the major design reviews and ongoing progress demonstrations. Continue managing key system interfaces for prototype Ground, Space, and Gateway Segments. Provide integration support for these components, along with the Space Hub End Cryptographic Unit (ECU) to the prototype payload contractors. Support PATS level integration and reduce risks to integrating with PTES and other partner programs. Conduct key interface tests between the PTS prototype and emulators/simulators to reduce risk prior to entering Build and Test phase of the payload. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased due to increased effort to support baseline management for design reviews and progress demonstrations.			
Title: Space Hub End Cryptographic Unit (ECU)	-	5.474	3.100
Description: Develop a single, National Security Agency (NSA) certified, space-flight qualified, production-ready Space Hub ECU for integration with the PTS payloads. Initiate execution of engineering and design work in advance of rapid prototype design and development to alleviate critical path risks to the launch of PTS payloads. Conduct requirements reviews, functional and design reviews, PTS interface development, Interface Control Document (ICD) coordination, and payload integration with PTS vendors. ***FY 2021 Plans:***			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206761SF *I Protected Tactical Service (PTS)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue Space Hub End Cryptographic Unit development. Conduct Security Verification Test (SVT) and obtain an Interim Authority to Test (IATT). Provide programmatic and integration support to facilitate ECU non-flight deliveries to support payload build and test activities. ***FY 2022 Plans:*** Complete development, and functional tests of Space Hub ECU. Obtain NSA certification. Conduct flight acceptance testing on production ready assemblies. Provide integration support to facilitate final flight delivery to enable payload build and test activities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased due to completion of functional tests of Space Hub ECU.			
Title: PTS Rapid Prototype Design and Development ***Description:*** Rapid prototyping of PTS space, ground, and gateway segments and key system components. Develop, demonstrate, test, and evaluate PTS hardware and software systems. Design and develop modular, scalable payloads to support hosted or free-flyer configurations. Demonstrate prototype payload performance on-orbit. Evaluate PTS concept of operations with user participation and enable potential residual operational capability. Mature and validate user requirements. Continue prototyping and risk reduction efforts. ***FY 2021 Plans:*** Conduct three major design reviews and mature key technologies to evaluate progress and performance of the payload prototype contractors. Prototype systems include payloads and buses, as well as payload and bus ground control elements. Continue software development and mature engineering design models. Develop and purchase hardware to support ongoing demonstrations of early prototype technology. Mature test and integration plans. Continue design and development of Space Segment interfaces between the Ground and Gateway Segments of the PTS System. Initiate the build and test phase for two flight prototype payloads. Finalize acquisition planning for payload host/bus and transition into integration of payload and bus to support capability demonstrations. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Complete the acquisition of vital prototype Ground and Gateway Segment equipment to enable testing and initial operations of prototype payloads. Continue development and design of Space Segment specific interfaces between the Ground and Gateway Segments of the PTS System. Continue developing, purchasing, and delivering government furnished software and hardware to allow ongoing demonstrations of prototype technology. Conduct Critical Design Review equivalent reviews and critical progress demonstrations to afford important feedback and maturation opportunities to the two remaining prototype contractors. Execute integration of bus and payloads to support capability demonstrations. Additionally, FY 2022 funding will allow the program to	-	165.928	187.507

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206761SF *I Protected Tactical Service (PTS)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased to support activities culminating to two Critical Design equivalent reviews and progress demonstrations.			
Title: Protected Tactical Testbed ***Description:*** Protected Tactical Testbed provides a government gold standard of reference for risk reduction and experimentation on critical technology elements for the space payload, terminals and networking segments of the PATS system. It enables system integration capabilities with industry and FFRDC partners for interoperability testing and conducting experiments to mature the PATS operations, with a focus on the Protected Tactical Waveform (PTW). ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** This is not a new start. This major thrust was transferred from PE1206431SF, Advanced EHF MILSATCOM (SPACE), in FY 2022. Testbed assets will continue to be used by both the government and contractor teams to support the PATS mission through vital system integration and demonstration events leading into their various major design reviews and essential risk reduction activities. Demonstrate interoperability between the Payload and the MMS, interoperability/interface and control of the Space Hub Integrated ECU Leading Edge Development (SHIELD) to the Payload, and compatibility with PATS user terminals. Perform eleven PTW Lead Service duties the Air Force is required to perform to ensure PTW will support the Department's Core Waveform program, to include verification of the PTW modem interoperability with the joint force. Utilize Joint SATCOM Engineering Center (JSEC) expertise to execute and enable critical testing activities for prototype payload contractors. Support the development and testing of the PTS Ground Entry Terminal Prototype (PGET-P). Support multi-service development of PATS user terminals (Army-Air force Anti-jam Modem and Navy WAMS) and final development stages of the PTES ground elements as they approach Mission Operational Test and Evaluation (MOT&E) and Initial Operational Capability (IOC). Continue use in outreach efforts to potential coalition partners and other emerging users, building upon demonstrations in FY 2020 and FY 2021 to demonstrate capability using their space, ground, and user terminal assets. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased due to transfer of Testbed from AEHF PE 1206431SF to PTS PE 1206761SF.	-	0.000	21.116
Accomplishments/Planned Programs Subtotals	-	200.178	243.285

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206761SF *I Protected Tactical Service (PTS)*

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

The PTS team utilizes the FY 2016 National Defense Authorization Act Section 804 guidance for Rapid Prototyping/Rapid Fielding and Section 815 OTA guidance in developing the acquisition strategy. This strategy places an emphasis on the rapid prototyping, production, and incremental iteration of PTS capability. This strategy takes the form of a series of successively honed and tailored spirals, focusing on payload development and hosting opportunities and incorporating lessons learned from Milstar, Enhanced Polar System (EPS), EPS-Recapitalization, Advanced Extremely High Frequency, PTES, and commercial SATCOM practices.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206761SF / *Protected Tactical Service (PTS)*	Project (Number/Name) 643728 / *Protected Tactical SATCOM*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Protected Tactical SATCOM Rapid Prototyping	C/FFP	Boeing & Northrop Grumman : Various	-	-		162.833	Jan 2021	183.056	Nov 2021	-		183.056	-	-	-
Space Hub End Cryptographic Unit (ECU)	C/CPIF	L3Harris East : Camden, NJ	-	-		5.474	Jan 2021	2.258	Jan 2022	-		2.258	-	-	-
Protected Tactical Testbed	Various	Various : Various	-	-		-		21.116	Dec 2021	-		21.116	-	-	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		10.132	Nov 2020	10.334	Nov 2021	-		10.334	-	-	-
Enterprise SE&I	Various	Various : Various	-	-		15.312	Jan 2021	20.048	Jan 2022	-		20.048	-	-	-
		Subtotal	-	-		193.751		236.812		-		236.812	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	MIPR	Aerospace : El Segundo, CA	-	-		1.068	Nov 2020	1.090	Nov 2021	-		1.090	-	-	-
A&AS	Various	Various : Various	-	-		5.309	Nov 2020	4.883	Nov 2021	-		4.883	-	-	-
Other Support	Various	Various : Various	-	-		0.050	Nov 2020	0.500	Nov 2021	-		0.500	-	-	-
		Subtotal	-	-		6.427		6.473		-		6.473	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		200.178		243.285		-		243.285	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206761SF / *Protected Tactical Service (PTS)*	**Project (Number/Name)** 643728 / *Protected Tactical SATCOM*

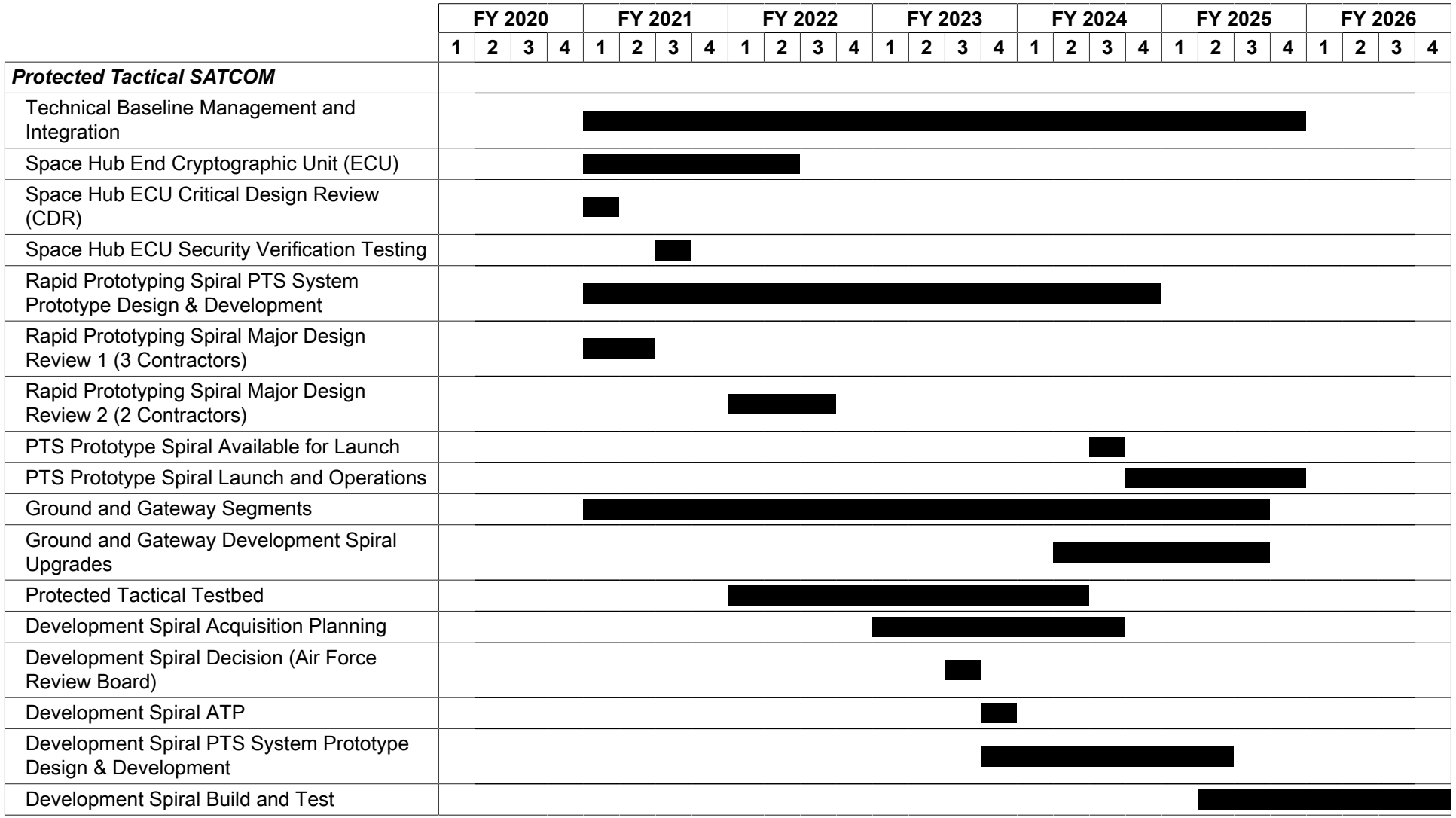

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206761SF / *Protected Tactical Service (PTS)*	**Project (Number/Name)** 643728 / *Protected Tactical SATCOM*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Capability Development Document (CDD) Joint Requirement Oversight Board (JROC) Decision																											■	
Production Spiral ATP																											■	

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206761SF / *Protected Tactical Service (PTS)*	**Project (Number/Name)** 643728 / *Protected Tactical SATCOM*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Protected Tactical SATCOM				
Technical Baseline Management and Integration	1	2021	4	2025
Space Hub End Cryptographic Unit (ECU)	1	2021	2	2022
Space Hub ECU Critical Design Review (CDR)	1	2021	1	2021
Space Hub ECU Security Verification Testing	3	2021	3	2021
Rapid Prototyping Spiral PTS System Prototype Design & Development	1	2021	4	2024
Rapid Prototyping Spiral Major Design Review 1 (3 Contractors)	1	2021	2	2021
Rapid Prototyping Spiral Major Design Review 2 (2 Contractors)	1	2022	3	2022
PTS Prototype Spiral Available for Launch	3	2024	3	2024
PTS Prototype Spiral Launch and Operations	4	2024	4	2025
Ground and Gateway Segments	1	2021	3	2025
Ground and Gateway Development Spiral Upgrades	2	2024	3	2025
Protected Tactical Testbed	1	2022	2	2024
Development Spiral Acquisition Planning	1	2023	3	2024
Development Spiral Decision (Air Force Review Board)	3	2023	3	2023
Development Spiral ATP	4	2023	4	2023
Development Spiral PTS System Prototype Design & Development	4	2023	2	2025
Development Spiral Build and Test	2	2025	4	2026
Capability Development Document (CDD) Joint Requirement Oversight Board (JROC) Decision	3	2026	3	2026
Production Spiral ATP	3	2026	3	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206855SF / *Evolved Strategic SATCOM (ESS)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	71.395	160.056	0.000	160.056	-	-	-	-	-	-
643725: *Evolved Strategic SATCOM (ESS)*	-	0.000	71.395	160.056	0.000	160.056	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The ESS system continues the strategic SATCOM mission of the Advanced Extremely High Frequency (AEHF) program by providing space and mission control segments for worldwide and arctic DoD strategic, secure, jam-resistant, communications for ground, sea, and air assets. ESS will meet the requirements for strategic communications and capability gaps identified in the Protected Satellite Communications Services (PSCS) Analysis of Alternatives (AoA), the Protected Follow-on for Resiliency (PAFR) Study and the Strategic Tiger Team. The ESS architecture and functionality will be designed in accordance with the United States Strategic Command's signed ESS Concept of Operations and the Joint Requirements Oversight Council's validated Capability Development Document (CDD) satisfying the legacy AEHF strategic requirements and mission performance with enhancements for increased resiliency and cybersecurity.

ESS will support strategic mission requirements to provide the National Command Authority (NCA) and Combatant Commanders with highly-reliable, secure Military Satellite Communications. ESS will support the forecasted 2032 strategic need in all operational environments and will be compatible with the existing architectures. The ESS system will satisfy emerging requirements using modular open system approaches to support incremental enhancements.

For more rapid and resilient strategic capability risk reduction, the ESS Program Office is executing its approved Space Segment acquisition strategy that leverages Middle Tier Acquisition authorities from the National Defense Authorization Act of 2016 for rapid prototyping, while maintaining the continuity of the AEHF strategic mission.

Activities for the ESS ground segment acquisition includes evolving and enhancing the existing ground segment, space-to-ground segment integration, and modernization in support of Enterprise Ground Services compatibility, in accordance with the acquisition strategies and schedules.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

The FY 2022 funding request was reduced by $5.777 million to account for the availability of prior year execution balances.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206855SF *I Evolved Strategic SATCOM (ESS)*

This program element may include necessary civilian pay expenses required to manage, execute, and deliver ESS weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	71.395	172.018	0.000	172.018
Current President's Budget	0.000	71.395	160.056	0.000	160.056
Total Adjustments	0.000	0.000	-11.962	0.000	-11.962
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-11.962	0.000	-11.962

Change Summary Explanation

FY 2022: -$4.200M; funds program to latest Non Advocate Cost Assessment (NACA) cost estimate; -$5.777M to account for the availability of prior year execution balances; -$.554M; due to inflation adjustment.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Segment Prototyping	-	57.243	134.544
Description: Award up to three competitive rapid-prototyping contracts. Invest in technology and demonstrations that enables continued development of a modernized, strategic payload and other key technology prototypes, risk reduction, and space segment design. Enables long-term return on investment and energizes industrial base for Strategic SATCOM, increased competition, promotion of innovation, and increased resiliency. Actively manage contractors through prototyping, demonstration and requirements/criteria needed for contractors to competitively bid on the ESS space segment Build, Integration and Test (I&T) and Delivery follow-on.			
FY 2021 Plans: Execute for up to three contractors, for the continuation of rapid prototyping and demonstrations of the payload and other key technologies, risk reduction, space segment design, delivery of contract items, and completion of planned milestone reviews			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206855SF *I Evolved Strategic SATCOM (ESS)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
and/or demonstrations. Each of the three contracts, awarded in FY 2020, have varying prototyping and demonstration plans and schedules, depending on the specific contractor. Includes all necessary program office, cyber, resiliency, and security support and equipment, Government contractor support for oversight and integration. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, and ESS testing assets. ***FY 2022 Plans:*** Continue execution of up to 3 rapid prototyping contracts with payload and other key technology demonstrations, risk reduction activities, space segment design focused on, but not limited to, delivery of initial ESS CONOPS, interoperability concepts, and crosslink demonstrations. Complete System Functional Reviews (SFR). Each of the contracts will have varying prototyping and demonstration plans and schedules, depending on the specific contractor. Each of the contractors will have varying requirements for hardware planning and purchase, procurement of contractor and government provided test equipment, manufacturing prototypes, and manpower ramp-up. Includes all necessary program office, cyber, resiliency, and security support and equipment as well as Government contractor support for oversight and integration. Additionally, FY 2022 funding will allow the program to rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. FFRDC, UARC, and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, and ESS testing assets. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased to complete the second year on three rapid prototyping contracts and support three contract teams designing and developing Space Payload Rapid Prototypes to successfully meet System Function Review requirements.			
Title: ESS Ground Segment and Space-to-Ground Integration ***Description:*** Develop and field the ESS ground segment, to include Mission Planning, Command and Control and other architecture and activities required to support the ESS space segment. Includes interoperability with the existing architectures and interfaces for EGS compatibility. Provide for space-to-ground (system) and mission integration for the ESS system. ***FY 2021 Plans:*** Complete acquisition planning for ground segment Phase 2 Mission Planning architectural design. Continue ground segment Phase 1 of up to five Broad Agency Announcement contracts for Mission Planning technology readiness. Continue ground segment In-Band and Out-of-Band Command and Control studies with design and development to best evolve these systems that are currently under sustainment. Procure and provide any government-furnished equipment or resources in support of design, integration and testing of the ESS system. Includes all required cryptography, cyber, resiliency, and security activities required and	-	8.182	15.360

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206855SF *I Evolved Strategic SATCOM (ESS)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Government contractor support for management and oversight. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, prototyping strategy, and ESS testing assets. Continue development activities in support of the ground segment and system/mission integration schedules. ***FY 2022 Plans:*** Complete five Broad Agency Announcement contracts for ground segment Phase 1 Mission Planning technology readiness. Knowledge gained from Phase 1 will inform analysis for Phase 2 Mission Planning architectural design, culminating in a presentation of the ground segment acquisition strategy to the Milestone Decision Authority for approval. Focus program office and other related activities on ground segment Phase 2 Mission Planning architectural design that includes, but is not limited to studies, technical analysis, market research, engagements with industry, acquisition strategy development, and source selection preparation. Prepare request for proposal and contract awards for ground segment Phase 2 Mission Planning architectural design in FY 2023. Continue ground segment In-Band and Out-of-Band Command and Control studies with design and development to best evolve these legacy systems. Includes all required cryptography, cyber, resiliency, and security activities as well as Government contractor support for management and oversight. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, prototyping strategy, and ESS testing assets. Continue development activities in support of the ground segment and system/mission integration schedules. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased to support ground segment development and acquisition strategy development and decision.			
Title: Space Segment Payload End-Cryptographic Unit (ECU) ***Description:*** Develop and deliver the National Security Agency (NSA)-certified ECUs required for secure strategic communications encryption in the ESS payloads and payload test terminals in accordance with the approved ECU acquisition strategy and schedule. Upon development completion, production ECU units will be delivered as government-furnished equipment for integration and testing with the ESS payloads and payload test terminals. ***FY 2021 Plans:*** Execute an approved space segment payload and payload test terminals ECU acquisition strategy, to include early definition and development that supports future delivery of the ECUs that meet the ESS control documents. Provide for NSA support on encrypted ECU requirements and standards. Plan and provide program office support, government-furnished equipment, studies or technical analyses, information or resources in support of prototyping activities. Includes all required cyber, resiliency, and security activities required and Government contractor support for management and oversight. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, and ESS testing assets. ***FY 2022 Plans:***	-	5.970	10.152

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206855SF *I Evolved Strategic SATCOM (ESS)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Provide for NSA support on encrypted ECU requirements and standards. Execute the approved space segment payload and payload test terminals ECU acquisition strategy with the Air Force's Lifecycle Management Center (AFLCMC) Cryptologic and Cyber System Division (CCSD) for ECU crypto development. Define and prepare for ECU development contract award to support future delivery of ECUs that meet the ESS control documents. Plan and provide program office support, government-furnished equipment, studies or technical analyses, and information or resources in support of prototyping activities. Includes all required cyber, resiliency, and security activities required as well as Government contractor support for management and oversight. FFRDC and UARC studies and technical support will assist with requirements trades, technical approaches, threat assessment and mitigation approaches, and ESS testing assets. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increase is to prepare and support ECU development contract award.			
Accomplishments/Planned Programs Subtotals	-	71.395	160.056

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

The Milestone Decision Authority (MDA) designated the ESS Space Segment as an FY 2016 National Defense Authorization Act Middle Tier Acquisition (Rapid Prototyping) activity and approved the ESS acquisition strategy on 14 December 2018. A rapid prototyping phase effectively replaces the Technology Maturation and Risk Reduction phase from a traditional acquisition under Department of Defense 5000 series Directives and Instructions. The ESS Program Office used this approach to award three (3) space segment contracts in late FY 2020 and early FY 2021 that focus on reducing space segment risks with the objective of maximizing ESS demonstrated capability for the payload and other key technologies. An ESS Program Office-led RFP and source selection will determine which space prototyping contractor(s), via their performance during the rapid prototyping phase, is positioned for the space segment Build, Integration and Test, and Delivery follow-on contract. The space prototyping contractors will be carried through the follow-on contract source selection to continue momentum until the follow-on contract is awarded in late FY 2025.

Return on investment from space prototyping will energize the industrial base and increase competition in strategic SATCOM; inject innovative technical, process and integration approaches; burn down risk early and identify/correct issues as early as possible; and decrease traditional fielding timelines to support a more resilient and responsive architecture against emerging threats. Success during competitive rapid-prototyping determines and informs follow-on Build, I&T and Delivery.

The initial Ground Segment Acquisition Strategy was approved by the Program Executive Officer (PEO) in 4th Quarter FY 2019 to begin early technology readiness studies for ESS Phase 1 Mission Planning in FY 2020. The Phase 2 Mission Planning architectural design acquisition strategy will be informed by Phase 1, and the ESS program forecasts a contract award in early FY2023. In-Band and Out-of-Band Command and Control studies are underway to best evolve these legacy systems.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206855SF *I Evolved Strategic SATCOM (ESS)*

A Space Segment Payload ECU acquisition strategy was delivered to the PEO for approval in FY 2021. The ESS program office plans to partner with the Air Force Lifecycle Management Center (AFLCMC) Cryptologic and Cyber System Division (CCSD) for ECU crypto development, both on the space vehicle for payload and bus cryptographic devices, and in the test terminal. Using a CCSD-led competitive RFP, a contract for payload and payload test terminal ECU development will be awarded in early FY 2023.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206855SF / *Evolved Strategic SATC OM (ESS)*	Project (Number/Name) 643725 / *Evolved Strategic SATCOM (ESS)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Space Segment Rapid Prototyping 1	SS/FFP	Northrop Grumman : Redondo Beach, CA	-	-		12.384	Oct 2020	35.389	Oct 2021	-		35.389	-	-	-
Space Segment Rapid Prototyping 2	SS/FFP	Boeing Company : El Segundo, CA	-	-		12.384	Oct 2020	35.389	Oct 2021	-		35.389	-	-	-
Space Segment Rapid Prototyping 3	SS/FFP	Lockheed Martin : Sunnyvale, CA	-	-		12.384	Oct 2020	35.389	Oct 2021	-		35.389	-	-	-
Ground Segment and Space-to-Ground Integration	TBD	TBD : TBD	-	-		1.999	Mar 2021	6.628	Jan 2022	-		6.628	-	-	-
Space Segment Payload End Cryptographic Unit (ECU)	TBD	TBD : TBD	-	-		1.333	Mar 2021	3.603	Jan 2022	-		3.603	-	-	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		11.228	Feb 2021	16.378	Nov 2021	-		16.378	-	-	-
Enterprise SE&I	C/CPIF	Linquest : Los Angeles, CA	-	-		11.463	Feb 2021	14.255	Feb 2022	-		14.255	-	-	-
		Subtotal	-	-		63.175		147.031		-		147.031	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	Various	Various : Various	-	-		3.455	Feb 2021	3.984		-		3.984	-	-	-
Other Support	Various	Various : Various	-	-		0.500	Mar 2021	0.500	Oct 2021	-		0.500	-	-	-
A&AS	Various	Various : Various	-	-		4.265	Mar 2021	8.541	Nov 2021	-		8.541	-	-	-
		Subtotal	-	-		8.220		13.025		-		13.025	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		71.395		160.056		-		160.056	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206855SF / *Evolved Strategic SATC OM (ESS)*	Project (Number/Name) 643725 / *Evolved Strategic SATCOM (ESS)*	

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206855SF / *Evolved Strategic SATC OM (ESS)*	**Project (Number/Name)** 643725 / *Evolved Strategic SATCOM (ESS)*

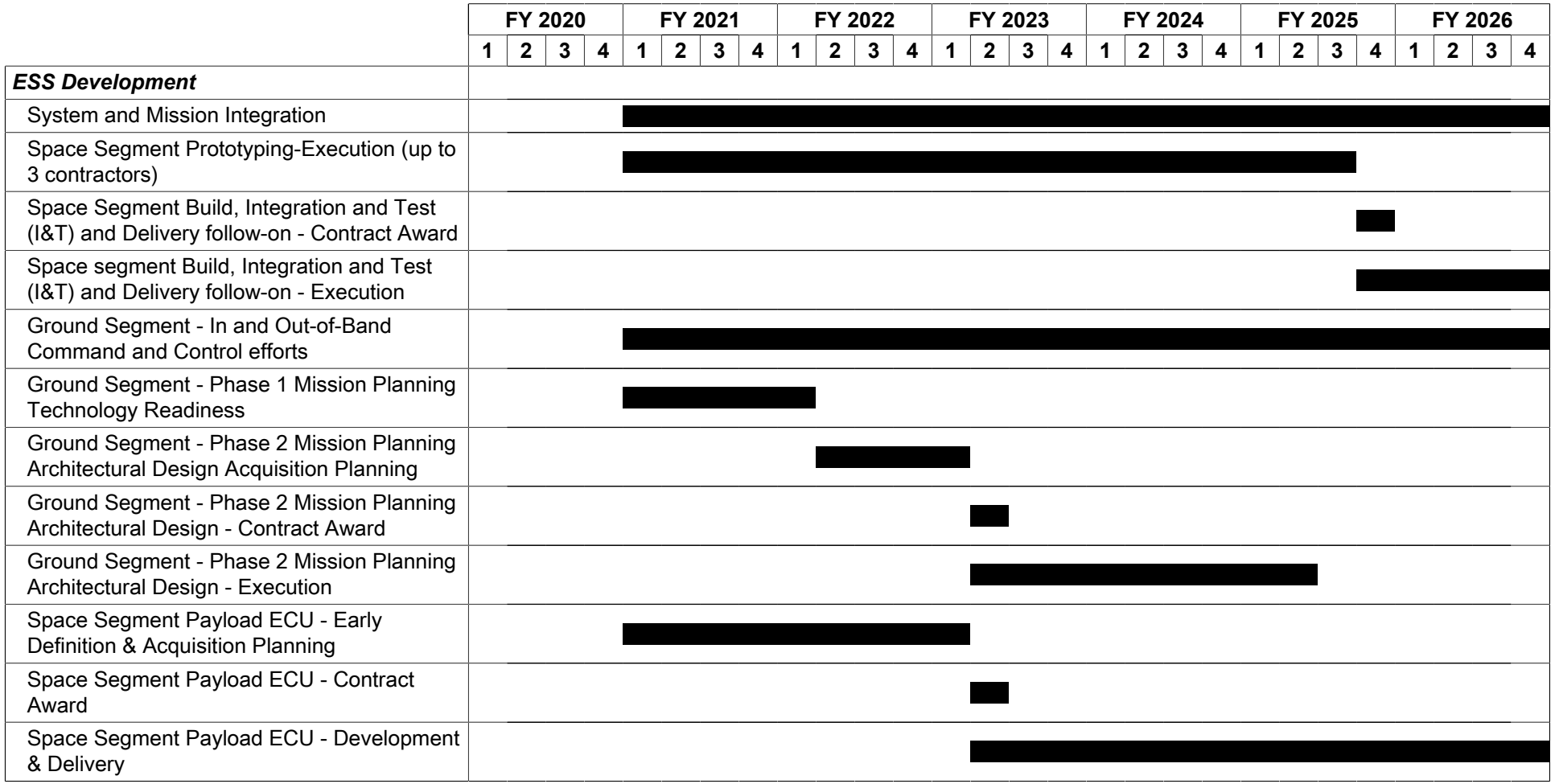

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206855SF / *Evolved Strategic SATC OM (ESS)*	**Project (Number/Name)** 643725 / *Evolved Strategic SATCOM (ESS)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
ESS Development				
System and Mission Integration	1	2021	4	2026
Space Segment Prototyping-Execution (up to 3 contractors)	1	2021	3	2025
Space Segment Build, Integration and Test (I&T) and Delivery follow-on - Contract Award	4	2025	4	2025
Space segment Build, Integration and Test (I&T) and Delivery follow-on - Execution	4	2025	4	2026
Ground Segment - In and Out-of-Band Command and Control efforts	1	2021	4	2026
Ground Segment - Phase 1 Mission Planning Technology Readiness	1	2021	1	2022
Ground Segment - Phase 2 Mission Planning Architectural Design Acquisition Planning	2	2022	1	2023
Ground Segment - Phase 2 Mission Planning Architectural Design - Contract Award	2	2023	2	2023
Ground Segment - Phase 2 Mission Planning Architectural Design - Execution	2	2023	2	2025
Space Segment Payload ECU - Early Definition & Acquisition Planning	1	2021	1	2023
Space Segment Payload ECU - Contract Award	2	2023	2	2023
Space Segment Payload ECU - Development & Delivery	2	2023	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 4: *Advanced Component Development & Prototypes (ACD&P)*					R-1 Program Element (Number/Name) PE 1206857SF / *Space Rapid Capabilities Office*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	108.518	66.193	0.000	66.193	-	-	-	-	-	-
64A020: *AF Funded ORSSats*	-	0.000	108.518	66.193	0.000	66.193	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Space Rapid Capabilities Office (Space RCO) mission is to expedite the development and fielding of operationally focused capabilities for immediate and near term needs as directed by the Space RCO Board of Directors (BoD). Key operating principles include a short and narrow chain of command, overarching programmatic insight, early and prominent war fighter involvement, and small integrated teams within a single office to rapidly augment existing space capabilities when needed, to expand operational capability, reconstitute/replenish/protect critical space capabilities to reserve "continuity of operations" capability, and exploit space technological or operational innovations to increase U.S. advantage.

The Space RCO is ready to develop, test, train, and equip war fighter needs as they are identified at any time. First, the requirements must be validated by the commander U.S. Space Command; second, the project must be approved by the Space RCO BoD; third, the project will be executed by the Space RCO. If the effort is initiated during execution year, it will be described in the next year's budget exhibit.

Space RCO is supporting the Air Force Research Lab (AFRL) developed Space Solar Power project to collect solar energy and provide uninterrupted, assured, and logistically agile power to expeditionary forces operating in unimproved areas such as forward operating bases. AFRL formulated the Space Solar Power Incremental Demonstrations and Research (SSPIDR) project to rapidly demonstrate this innovative technology via a series of integrated demos and technology development/ maturation efforts.

In addition, Space RCO will conduct studies and analysis for future programs to support the BoD.

The FY 2022 funding request was reduced by 7.342 million to account for the availability of prior year execution balances.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Space RCO weapon system capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206857SF *I Space Rapid Capabilities Office*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	103.518	9.356	0.000	9.356
Current President's Budget	0.000	108.518	66.193	0.000	66.193
Total Adjustments	0.000	5.000	56.837	0.000	56.837
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	5.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	56.837	0.000	56.837

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 64A020: *AF Funded ORSSats*		
Congressional Add: *Space RCO Solar Power Congressional Add*	0.000	5.000
Congressional Add Subtotals for Project: 64A020	0.000	5.000
Congressional Add Totals for all Projects	0.000	5.000

Change Summary Explanation

FY2021: +$5M Congressional Add for University Affiliated Research Center for Space Solar Power

FY2022: +$65M added to continue Space Solar Power effort; -$7.342M for underexecution; -$0.821M inflation adjustment

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space RCO Board of Directors (BoD) Projects, Studies, and Analysis	-	17.638	8.826

Description: Execute projects, studies, and analysis under rapid acquisition authorities inherent to the Space RCO, that address emergent capabilities and respond to validated requirements and other BoD approved efforts to meet needs in year of execution. In addition, provide systems engineering, program management support and civilian pay across all the Space RCO activities as well as perform modeling, simulation, analysis, and assess alternative concepts and requirements.

FY 2021 Plans:

Continue to initiate rapid acquisition projects, studies, and analysis that address emergent capabilities requirements and other Space RCO BoD approved efforts. Continue program office and other related support activities that may include, but are

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206857SF *I Space Rapid Capabilities Office*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
not limited to studies, technical analysis, prototyping, etc. Continue ongoing systems engineering support of future mission development as well as Program office support and potentially including Civilian pay. Activities may include, but are not limited to program office support, facilities, and studies. ***FY 2022 Plans:*** Continue to initiate rapid acquisition projects, studies, and analysis that address emergent capabilities requirements and other Space RCO BoD approved efforts. Continue ongoing systems engineering support of future mission development. Additionally, FY 2022 funding will allow the program to rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 primarily due to completion of the Space RCO stand up in FY 2021.			
Title: Space RCO Solar Power ***Description:*** Space RCO is developing the Solar Power project to collect solar energy and provide uninterrupted, assured, and logistically agile power to expeditionary forces operating in unimproved areas such as forward operating bases. ***FY 2021 Plans:*** Continue developing space-based solar power collection and transmission technology via a series of integrated demos and technology development/maturation efforts: 1) demonstration of a solar-to-Radio Frequency (RF) tile and rectenna, 2) space flight demonstration of solar-to-RF panel payload, and 3) demonstration of scaled array payloads; operational prototype concept designs/analysis; and functional demonstrations for critical technologies in energy generation, deployable structures, thermal technology, and RF transmission. ***FY 2022 Plans:*** Continue developing space-based solar power collection and transmission technology via a series of integrated demos and technology development/maturation efforts: 1) complete report and model updates from solar-to-RF tile and rectenna demo, 2) continue to space flight demonstration of solar-to-RF panel payload (take delivery of solar-to-RF payload, validate payload, integrate payload-to-bus), and 3) complete demonstration of scaled array payloads for ground demonstration and validate models; update operational prototype concept designs/analysis based on tile demonstrations and updated models; and functional demonstrations for critical technologies in energy generation, deployable structures, thermal technology, and RF transmission. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to finishing individual projects.	0.000	85.880	57.367
Accomplishments/Planned Programs Subtotals	0.000	103.518	66.193

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 4: *Advanced Component Development & Prototypes (ACD&P)*	**R-1 Program Element (Number/Name)** PE 1206857SF *I Space Rapid Capabilities Office*

	FY 2020	FY 2021
Congressional Add: Space RCO Solar Power Congressional Add	0.000	5.000
FY 2020 Accomplishments: N/A		
FY 2021 Plans: The Space Force, through AFRL/RV and in coordination with OSD/RE, will initiate the process of establishing a University Affiliated Research Center (UARC)/consortium to aid in executing space cross mission, multi-domain, and community of interest research applicable to Space Solar Power activities that are consistent with USD(R&E) priority focus areas and the National Security Space Strategy.		
Congressional Adds Subtotals	0.000	5.000

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

For the Congressionally Added $5M AFRL will establish and execute space cross mission, multi-domain, and community of interest research in partnership university systems applicable to Space Solar Power activities that are consistent with USD(R&E) priority focus areas and the National Security Space Strategy.

E. Acquisition Strategy

Expeditiously award contracts through Space RCO or partner organizations.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206857SF / *Space Rapid Capabilities Office*	**Project (Number/Name)** 64A020 / *AF Funded ORSSats*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Space RCO Board of Directors (BoD) Projects, Studies, and Analysis	Various	Various : Various	-	-		13.269	Mar 2021	4.550	Mar 2022	-		4.550	-	-	-
Space RCO Solar Power	SS/CPFF	Northrop Grumman : Linthicum, MD	-	-		90.880	Nov 2020	57.193	Nov 2021	-		57.193	-	-	-
		Subtotal	-	-		104.149		61.743		-		61.743	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace/Sandia Labs : Various	-	-		3.672	Dec 2020	3.750	Dec 2021	-		3.750	-	-	-
A&AS	Various	Various : Various	-	-		0.697	Dec 2020	0.700	Dec 2021	-		0.700	-	-	-
		Subtotal	-	-		4.369		4.450		-		4.450	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		108.518		66.193		-		66.193	-	-	N/A

Remarks

FY 2022 decreased compared to FY 2021 primarily due to completion of the Space RCO stand up in FY 2021.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206857SF / *Space Rapid Capabilities Office*	**Project (Number/Name)** 64A020 / *AF Funded ORSSats*

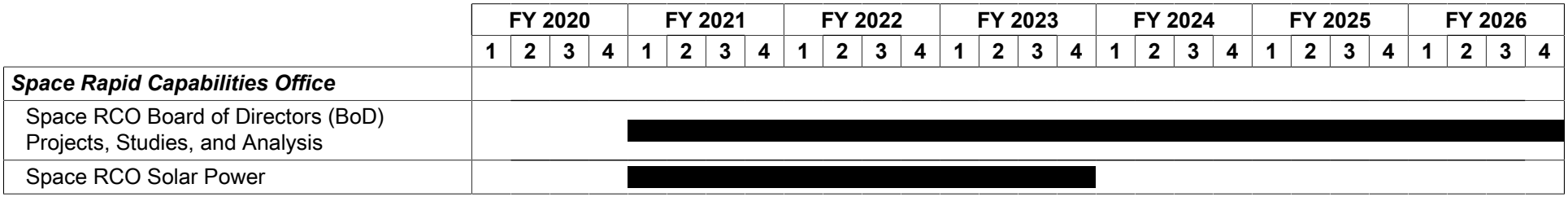

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 4	**R-1 Program Element (Number/Name)** PE 1206857SF / *Space Rapid Capabilities Office*	**Project (Number/Name)** 64A020 / *AF Funded ORSSats*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Space Rapid Capabilities Office				
Space RCO Board of Directors (BoD) Projects, Studies, and Analysis	1	2021	4	2026
Space RCO Solar Power	1	2021	4	2023

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1203269SF / *GPS III Follow-On (GPS IIIF)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	285.496	264.265	0.000	264.265	-	-	-	-	-	-
653170: *GPS IIIF*	0.000	0.000	285.496	264.265	0.000	264.265	-	-	-	-	-	-
Quantity of RDT&E Articles	2	-	-	-	-	-	-	-	-	-		
Program MDAP/MAIS Code: 590												

A. Mission Description and Budget Item Justification

The Global Positioning System (GPS) is a space-based navigation system that fills validated Joint Service requirements for worldwide, accurate, common grid three-dimensional positioning/navigation for military aircraft, ships, and ground personnel. The consistent accuracy, unaffected by location or weather and available in real time, significantly improves effectiveness of reconnaissance, weapons delivery, mine countermeasures and rapid deployment for all services. GPS must comply with Title 10 United States Code (USC) Sec. 2281, which requires that the Secretary of Defense ensures the continued sustainment and operation of GPS for military and civilian purposes, and 51 USC Sec. 50112, which requires that GPS complies with certain standards and facilitates international cooperation.

The system is composed of three segments: User Equipment (funded under Program Element (PE) 1203164F), Space (funded under PE 1203265F, 1203165F, and 1203269F), and a Control Network (funded under PE 1206423F and 1203165F). The satellites broadcast high-accuracy data using precisely synchronized signals that are received and processed by user equipment installed in military platforms. The user equipment computes the platform position and velocity and provides steering vectors to target locations or navigation waypoints. The control segment provides daily updates to the navigation messages broadcast from the satellites to maintain system precision in three dimensions to 16 meters (spherical error probable) worldwide. Additionally, GPS supports the United States Nuclear Detonation (NUDET) Detection System (USNDS) mission and provides strategic and tactical support to the following Department of Defense (DoD) missions: Joint Operations by providing capabilities for Positioning, Navigation, and Timing (PNT); Command, Control, Communications, and Intelligence (C3I); Special Operations; Military Operations in Urban Terrain (MOUT); Defense-Wide Mission Support (DWMS); Air Mobility; and Space Launch Orbital Support.

GPS IIIF delivers GPS III satellites beyond the first ten Space Vehicles (SVs) being delivered by the GPS III program (funded in PE 1203265F GPS III Space Segment). The GPS IIIF satellites maintain the same capabilities as the GPS III satellites, but also delivers significant enhancements to include: potential on-ramping of advanced PNT technology from efforts such as NTS-3, backward compatibility, unified S-Band (USB) interface compliance, integration of hosted payloads including a redesigned USNDS payload, Laser Retro-reflector Arrays (LRAs), Search and Rescue/GPS (SAR/GPS), Energetic Charged Particles (ECP) sensor, and Regional Military Protection (RMP) capabilities that provide the ability to deliver high-power regional Military Code (M-Code) signals in specific areas of intended effect. Implementation of RMP into the GPS Enterprise requires integration with the ground and user segments, executed by the GPS Next Generation Operational Control System (OCX), along with the Military GPS User Equipment (MGUE) programs, respectively. The SAR/GPS payload provided by Canada fills a validated National Search and Rescue Committee requirement to provide enduring, space-based distress alerting capability to detect, locate, and relay distress alerts to fulfill its responsibilities under international agreements for Search and Rescue. LRA, built by the Naval Research Lab (NRL), is a passive reflector that improves accuracy and provides better ephemeris data. National Geospatial-Intelligence Agency (NGA) funds the integration costs of the LRA.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1203269SF *I GPS III Follow-On (GPS IIIF)*

This PE funds the Research, Development, Test, and Evaluation (RDT&E) of GPS IIIF SVs 11-12 (to include Non-Recurring Engineering (NRE) support efforts). This program includes risk-reducing simulators and systems engineering associated with delivering the new capabilities required of GPS IIIF satellites.

In a future budget cycle, PE 1206423F, Global Positioning System III - Operational Control Segment, Project 67A025, Appn 3620, GPS Enterprise Integrator (EI) efforts will be transferred to PE 1203269SF, Global Positioning System IIIF, Project 653170, Appn 3620 Space Programs in order to continue enterprise integration activities after OCX is completed.

The GPS EI project includes critical efforts associated with the Government's responsibility to accomplish integration of multiple prime contracts across the three GPS enterprise segments along with the transition to sustainment and operational communities. The GPS EI maintains the GPS current architecture and system definition, controls and validates interfaces, ensures compatibility across current Generation II and III systems, and ongoing developments such as GPS IIIF space systems, OCX control systems, and MGUE Inc 1 and MGUE Inc 2 systems. GPS EI also develops/manages plans for execution and fielding of new capability like the new Military Code for use at the earliest opportunity. Further, GPS EI provides modeling, simulation, and technical analyses of impacts for Government directed enterprise level trades among the GPS segments leading to definition, management, maintenance, and evolution of the GPS Enterprise requirements and interface technical documents to build and ensure the integrity of the enterprise technical baseline, and perform system requirements verification.

In addition, the GPS EI project funds the technical evolution, risk reduction, enterprise-level testing and delivery of all PNT Enterprise, capabilities. The GPS EI project also assists in the analysis and assessment of futures technology to continue the advancement of the PNT enterprise ensuring PNT capabilities continue to be at the forefront. Examples for Generation II include electronic protection; for Generation III, additional anti-jamming protection and additional civil signals. To accomplish this, GPS EI delivers Test and Verification capabilities, Requirements and Interface Management, and Systems Integration support across the Space, Control, and User Segments. In this capacity, GPS EI is responsible for managing this cross-program work to provide these and other capabilities.

GPS EI's analyses guides Government decisions to ensure efficient and effective synchronization and execution across all GPS II and III programs. For Enterprise-wide integration to be successful, the GPS EI: works with the GPS and NDS prime contractor teams to develop plans for early risk reduction System Integration Demonstrations to ensure system interfaces and functionality meet user and system requirements; ensures all equipment and documentation is ready when needed; integrates and analyzes enterprise schedules; and conducts formal test and verification, including Requirement Verification Plans and System Test Plans and Procedures. GPS EI performs all these efforts across all PNT programs in all acquisition phases. The Government owns the GPS Enterprise system requirements and integration, and highly leverages the GPS EI team to eliminate the need to fund a development prime contractor to perform these functions. This enhances Government control, oversight and program accountability.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1203269SF *I GPS III Follow-On (GPS IIIF)*

This PE may include necessary civilian pay expenses required to manage, execute, and deliver GPS IIIF Space Segment weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in PEs 1206392SF and 1206398SF.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	263.496	267.542	0.000	267.542
Current President's Budget	0.000	285.496	264.265	0.000	264.265
Total Adjustments	0.000	22.000	-3.277	0.000	-3.277
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-8.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	30.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-3.277	0.000	-3.277

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 653170: *GPS IIIF*		
Congressional Add: *Navigation Technology Satellite-3 (NTS-3) Payload and Launch*	-	30.000
Congressional Add Subtotals for Project: 653170	-	30.000
Congressional Add Totals for all Projects	-	30.000

Change Summary Explanation

FY 2021: +30.000M; Congressional Add for NTS-3 payload and launch
FY 2021: -8.00M; Congressional Directed Reduction for prior year carryover
FY 2022: -3.277M; Funding decreased to adjust for inflation

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: GPS III Follow-On (GPS IIIF) Development	0.000	255.496	264.265
Description: The program utilizes RDT&E funds to develop and deliver SVs 11-12, conduct the NRE of developing risk-reducing simulators, developing support test equipment, and conducting the systems engineering associated with delivering the new			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1203269SF *I GPS III Follow-On (GPS IIIF)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
capabilities required of GPS IIIF including backward compatibility, dual band Telemetry, Tracking, and Control (TT&C), integration of Government Furnished Equipment (GFE) hosted payloads, and RMP, which delivers high power regional M-Code signals in specific areas of intended effect. ***FY 2021 Plans:*** Continue development and NRE efforts to simultaneously support three satellites (SV11, SV12, & GNST+) in preparation for the start of system integration and the final build and checkout of two software simulators (GSS). Efforts include hardware purchases of long lead items. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Continue development and NRE efforts to simultaneously support three satellites (SV11, SV12, & GNST+) in support of system integration and the final build and checkout of two software simulators (GSS). Efforts include hardware purchases of long lead items. Complete GSS 1& 2 subsystem development, procurement and build; continue system integration. Complete GNST+ subsystem development, procurement and build; begin system integration. Complete SV11 subsystem development, procurement and build; begin system integration and test. Continue development, NRE, subsystem procurement, and build of SV12. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to multiple concurrent development, procurement, and build activities.			
Accomplishments/Planned Programs Subtotals	0.000	255.496	264.265

	FY 2020	FY 2021
Congressional Add: Navigation Technology Satellite-3 (NTS-3) Payload and Launch	-	30.000
FY 2021 Plans: The Congressional Add supports ground system development, space vehicle development, first year of on-orbit operations, procurement of the space vehicle pre-launch processing facility, mission unique launch vehicle integration, mission unique hardware, mission unique software, and separation system procurement for NTS-3. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.		
Congressional Adds Subtotals	-	30.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1203269SF *I GPS III Follow-On (GPS IIIF)*

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPSF 01 BA01 GPS03C: *GPSIII Follow On*	0.000	597.796	601.418	0.000	601.418	-	-	-	-	-	-

Remarks

E. Acquisition Strategy

In December 2017, Principal Deputy Office of the Assistant Secretary of the Air Force Acquisition & Logistics) began the GPS IIIF program. Beginning in FY 2019 and, consistent with the Fiscal Year 2016 National Defense Authorization Act (NDAA), the program was categorized as an Acquisition Category (ACAT) (1B) Major Defense Acquisition Program (MDAP) with the Service Acquisition Executive (SAE) serving as the Milestone Decision Authority (MDA). During this time, the MDA approved the second phase of the two-phased GPS III Follow-On acquisition strategy. Executed using funds in PE 1203265F, GPS III Space Segment, the Phase 1 Production Readiness Feasibility Assessments conducted during FY 2016-2017 provided data and insight into contractors' GPS satellite production designs with emphasis on a mature navigation payload and production-ready designs. Phase 1 results affirmed the viability of a competitive approach for Phase 2. The Phase 2 strategy directed the Air Force to conduct a full-and-open competition for GPS IIIF space vehicles and specified the use of RDT&E funds to deliver SVs 11-12 and conduct associated NRE. In addition to SVs 11-12, the RDT&E effort will be comprised of developing risk-reducing simulators, support test equipment, and conducting the systems engineering associated with delivering the new capabilities required of GPS IIIF. The Air Force awarded the contract to Lockheed Martin in September 2018 and began the 1-year CDR campaign in March 2019. Completion of CDR was done in March 2020 and Milestone C certification completed in July 2020. The Space Force will procure SV 13+ via annual contract options exercised using Space Procurement, Air Force (SPAF) and Procurement, Space Force (PSF) funds consistent with full-funding policy under an annual buy approach.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1203269SF / *GPS III Follow-On (GPS III F)*	Project (Number/Name) 653170 / *GPS IIIF*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS IIIF Development	C/FPIF	Lockheed Martin : Littleton, CO	0.000	-		227.716	Dec 2020	238.222	Dec 2021	-		238.222	-	-	-
NTS-3 Payload and Launch	Various	Various : Various	0.000	-		30.000	Feb 2021	-		-		-	-	-	-
GPS IIIF Technical Mission Analysis	MIPR	Various : Various	0.000	-		7.881	Dec 2020	3.474	Dec 2021	-		3.474	-	-	-
GPS IIIF Enterprise SE&I	C/CPAF	SAIC : El Segundo, CA	0.000	-		7.357	Dec 2020	7.381	Dec 2021	-		7.381	-	-	-
		Subtotal	0.000	-		272.954		249.077		-		249.077	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS IIIF Test and Evaluation	Various	Various : Various	0.000	-		2.000	Apr 2021	3.800	Dec 2021	-		3.800	-	-	-
		Subtotal	0.000	-		2.000		3.800		-		3.800	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS IIIF FFRDC	MIPR	Aerospace Corp : El Segundo, CA	0.000	-		2.663	Dec 2020	2.183	Dec 2021	-		2.183	-	-	-
GPS IIIF A&AS	Various	Various : El Segundo, CA	0.000	-		6.738	Dec 2020	8.805	Dec 2021	-		8.805	-	-	-
GPS IIIF Other Support	Various	Various : El Segundo, CA	0.000	-		1.141	Oct 2020	0.400	Oct 2021	-		0.400	-	-	-
		Subtotal	0.000	-		10.542		11.388		-		11.388	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1203269SF / *GPS III Follow-On (GPS III F)*	Project (Number/Name) 653170 / *GPS IIIF*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		285.496		264.265		-		264.265	-	-	N/A

Remarks

FINANCIAL PERFORMANCE: GPS IIIF is evaluated against traditional Research and Development (R&D) program expenditure benchmarks. However, unlike many traditional R&D programs, the GPS IIIF R&D and Production phases fall under a Fixed Price Incentive Firm Target (FPIF) contract type with progress payments. Mandatory funding obligations and progress payment withholds will cause the program to lag traditional expenditure benchmarks, painting an inaccurate portrait of overall program health.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1203269SF / *GPS III Follow-On (GPS III F)*	**Project (Number/Name)** 653170 / *GPS IIIF*

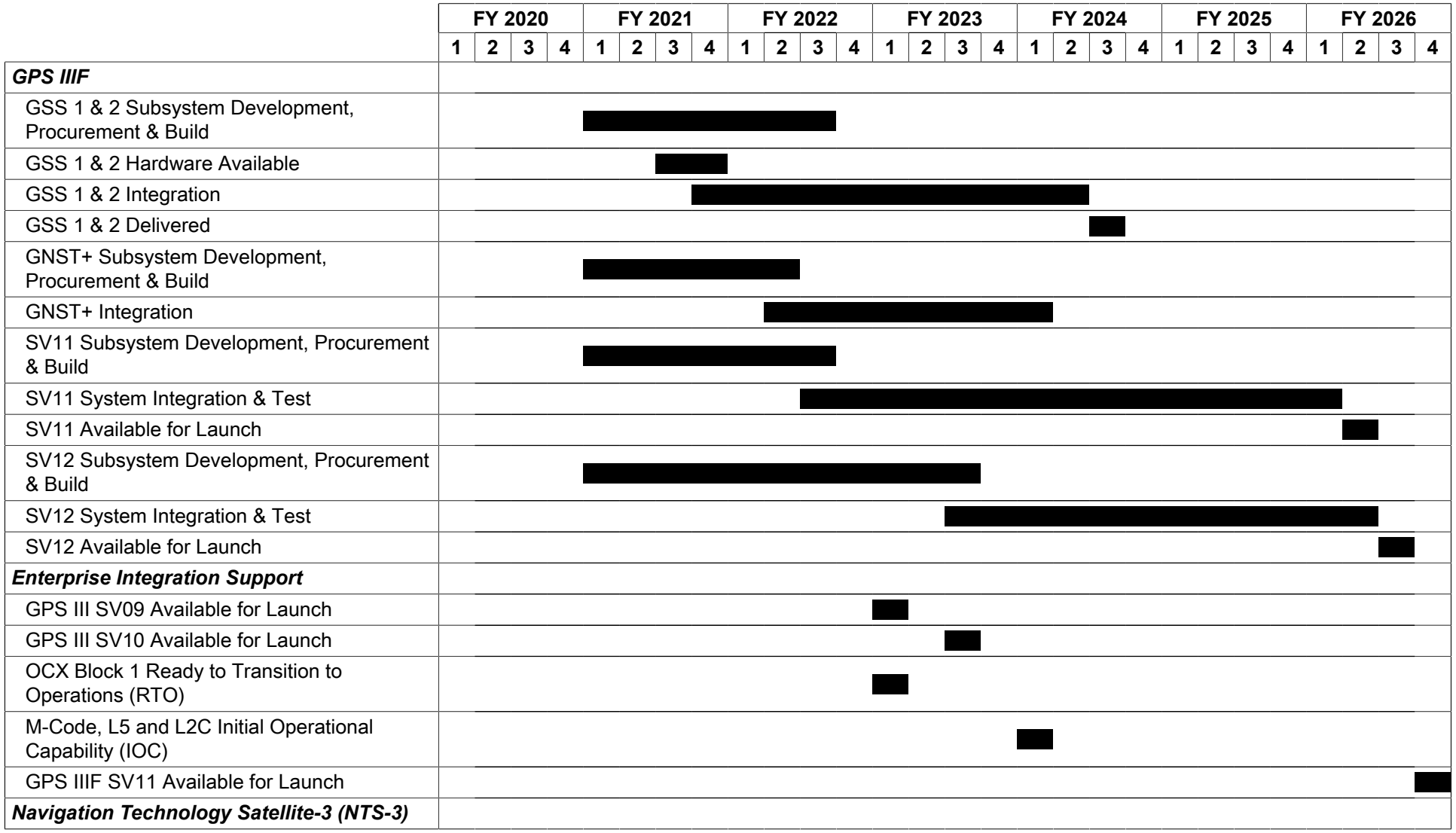

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1203269SF / *GPS III Follow-On (GPS III F)*	**Project (Number/Name)** 653170 / *GPS IIIF*

	FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
NTS-3 Payload and Launch						[redacted]																						

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1203269SF / *GPS III Follow-On (GPS III F)*	**Project (Number/Name)** 653170 / *GPS IIIF*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GPS IIIF				
GSS 1 & 2 Subsystem Development, Procurement & Build	1	2021	3	2022
GSS 1 & 2 Hardware Available	3	2021	4	2021
GSS 1 & 2 Integration	4	2021	2	2024
GSS 1 & 2 Delivered	3	2024	3	2024
GNST+ Subsystem Development, Procurement & Build	1	2021	2	2022
GNST+ Integration	2	2022	1	2024
SV11 Subsystem Development, Procurement & Build	1	2021	3	2022
SV11 System Integration & Test	3	2022	1	2026
SV11 Available for Launch	2	2026	2	2026
SV12 Subsystem Development, Procurement & Build	1	2021	3	2023
SV12 System Integration & Test	3	2023	2	2026
SV12 Available for Launch	3	2026	3	2026
Enterprise Integration Support				
GPS III SV09 Available for Launch	1	2023	1	2023
GPS III SV10 Available for Launch	3	2023	3	2023
OCX Block 1 Ready to Transition to Operations (RTO)	1	2023	1	2023
M-Code, L5 and L2C Initial Operational Capability (IOC)	1	2024	1	2024
GPS IIIF SV11 Available for Launch	4	2026	4	2026
Navigation Technology Satellite-3 (NTS-3)				
NTS-3 Payload and Launch	2	2021	4	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1203940SF / *Space Situation Awareness Operations*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	36.897	56.279	0.000	56.279	-	-	-	-	-	-
65A037: *Ground Based Optical Sensor*	-	0.000	36.897	56.279	0.000	56.279	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

GBOSS is an upgrade to the Ground-based Electro-Optical Deep Space Surveillance (GEODSS) system that enables GEODSS to monitor small, closely-spaced, and advanced threats in low, mid, high, and geostationary orbits. The upgraded system monitors orbits globally and delivers the data required to support accurate, timely, actionable Space Domain Awareness (SDA). This facilitates decision making within the compressed timelines dictated by the realities of the congested, contested, competitive space domain. The program fields new GEODSS sites, including mission facilities and equipment, in Europe and the Indo-Pacific region to mitigate the Atlantic optical gap, and provide full global coverage. The program also includes updates to the GEODSS image processing and optical subsystems that will enhance the sensitivity and search rate and fields new multi-spectral advanced technology sensors at the GEODSS sites.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or re-purpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver GBOSS capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awareness Operations*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	41.897	51.977	0.000	51.977
Current President's Budget	0.000	36.897	56.279	0.000	56.279
Total Adjustments	0.000	-5.000	4.302	0.000	4.302
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-5.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	4.302	0.000	4.302

Change Summary Explanation

FY 2021: -$5.0M Congressional reduction for contract award delay.

FY 2022: +$4.497M -- $5.0M increase to complete enhanced telescope upgrade, integration and test; transferred from Project 640290, Deep Space Advanced Radar Concept (DARC), Program Element 1206425SF, Space Situation Awareness Systems; $0.503M reduction to account for inflation.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Ground Based Optical Sensor System (GBOSS)	-	36.897	56.279

Description: GBOSS provides a global, ground-based, optical sensor capability for Space Domain Awareness (SDA). It implements system resiliency to operate in the contested space domain based on aggressive threats by our near-peer adversaries, China and Russia. GBOSS improves sensitivity, search rate, tracking of non-cooperative launches, precise tagging of clustered objects, and detection of closely spaced dim objects. This effort includes fielding GBOSS capabilities in optimal global locations, upgrading existing GEODSS sensors, and may acquire new advanced technology sensors to improve global electro-optical sensor resilience and persistence. The project will coordinate with Combined Space Operations Center (CSpOC), National Space Defense Center (NSDC), and National Air and Space Intelligence Center (NASIC) efforts to ensure enterprise data fusion and dissemination supporting Enterprise Space Battle Management Command, and Control (ESBMC2).

FY 2021 Plans:

Complete GBOSS Technology Maturation and Risk Reduction (TMRR) and initiate Engineering Manufacturing Development (EMD). Complete design through Critical Design Review (CDR) (including System Requirements Review (SRR) and Preliminary Design Review (PDR)). Initiate facility preparation for two overseas sites and for modifications to one US site. Post CDR, initiate software and hardware development. Rapidly implement system resiliency and situational awareness changes required to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1203940SF *I Space Situation Awareness Operations*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. ***FY 2022 Plans:*** Complete the software and hardware development for the GEODSS Enhanced Telescope (GET) upgrade and install and test it at the White Sands Missile Range (WSMR) GEODSS site. Install GET hardware and software at the Maui GEODSS site and begin testing. Upgrade infrastructure and start facility build of European site to close the Atlantic Optical Gap to support Initial Operational Capability (IOC) in FY 2024. Begin infrastructure upgrades and facility build of Indo-Pacific site to provide full global coverage by FY 2026. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021. This increase is due to upgrading and testing the telescope at the WSMR GEODSS site and beginning installation and test for upgraded telescope hardware and software at the Maui GEODSS site, in parallel with upgrading infrastructure to begin construction on two new overseas GEODSS sites.			
Accomplishments/Planned Programs Subtotals	-	36.897	56.279

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

This program began in FY 2018 to address ground-based optical SDA gaps and shortfalls. The acquisition strategy, approved in March 2018, accelerates the development and fielding of the solution, minimizing the time to address the requirements in light of current and emerging threats. Initial TMRR activities were executed using existing defense, intelligence, and lab contracts. EMD activities are being executed on the Maintenance of Space Situational Awareness Integrated Capabilities (MOSSAIC) contract awarded through full and open competition. The approved acquisition strategy supports fielding Initial Operational Capability (IOC) in the European theater in FY 2024 and Final Operational Capability (FOC) of the global capability in FY 2026.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1203940SF / *Space Situation Awarenes s Operations*	Project (Number/Name) 65A037 / *Ground Based Optical Sensor*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GBOSS design, development and life extension	Various	L3Harris : Colorado Springs, CO	-	-		25.565	Mar 2021	40.671	Nov 2021	-		40.671	-	-	-
GBOSS Technical Mission Analysis	C/CPIF	Various : Various	-	-		6.019	Nov 2020	2.819	Nov 2021	-		2.819	-	-	-
		Subtotal	-	-		31.584		43.490		-		43.490	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	Various : Various	-	-		2.567	May 2021	7.009	Nov 2021	-		7.009	-	-	-
FFRDC	Various	Various : Various	-	-		2.696	Apr 2021	5.000	Nov 2021	-		5.000	-	-	-
Other Support	C/CPAF	Various : Various	-	-		0.050	Nov 2020	0.780	Nov 2021	-		0.780	-	-	-
		Subtotal	-	-		5.313		12.789		-		12.789	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		36.897		56.279		-		56.279	-	-	N/A

Remarks

The GBOSS program has minimal organic resources. The FY 2022 increase in Management Services is due to parallel efforts to finalize international agreements in two countries, award the construction contracts, and begin work on the construction of facilities while simultaneously maintaining surveillance and management of the telescope development in the U.S. Additionally, specialized FFRDC knowledge and expertise in optics will support the enhanced telescope upgrade effort.

All contract activity in FY 2022 occurs through obligations in November as previously awarded contracts continue execution.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 65A037 / *Ground Based Optical Sensor*

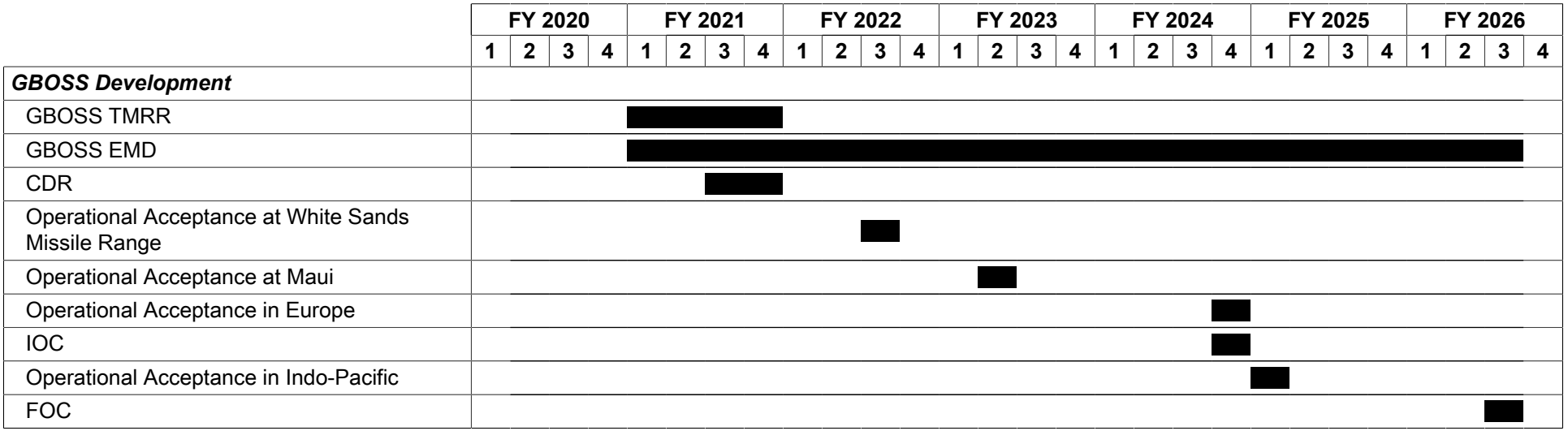

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 65A037 / *Ground Based Optical Sensor*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GBOSS Development				
GBOSS TMRR	1	2021	4	2021
GBOSS EMD	1	2021	3	2026
CDR	3	2021	4	2021
Operational Acceptance at White Sands Missile Range	3	2022	3	2022
Operational Acceptance at Maui	2	2023	2	2023
Operational Acceptance in Europe	4	2024	4	2024
IOC	4	2024	4	2024
Operational Acceptance in Indo-Pacific	1	2025	1	2025
FOC	3	2026	3	2026

Note

FY 2022: IOC/FOC delayed from FY 2021 PB Schedule due to six month delay in international agreements and inability to initiate site surveys due to international travel restrictions. Schedule updated following completion of TMRR, successful Milestone B review in September 2020, and establishing Acquisition Program Baseline.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206421SF / *Counterspace Systems*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	57.189	38.063	0.000	38.063	-	-	-	-	-	-
65A001: *Counter Satellite Communications System*	-	0.000	50.453	33.438	0.000	33.438	-	-	-	-	-	-
65A005: *Offensive Counterspace (OCS) C2*	-	0.000	2.252	2.619	0.000	2.619	-	-	-	-	-	-
65A013: *BOUNTY HUNTER*	-	0.000	4.484	2.006	0.000	2.006	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

Acquisition Decision Memorandum (ADM) April 24th 2009, directed all capabilities identified in the October 4th 2006, Counter Communications System (CCS) Block 20, Joint Requirements Oversight Council (JROC) approved Capability Development Document (CDD) shall be accomplished as Pre-planned Product Improvement Program (P3I) upgrades to the CCS Block 10. On April 11th 2016, Air Force Space Command (AFSPC) updated ADM adding additional responsibility for CCS Block 10.3 Meadowlands.

CCS provides expeditionary, deployable, reversible offensive space control (OCS) effects applicable across the full spectrum of conflict. It prevents adversary Satellite Communications (SATCOM) in Area of Responsibility (AOR) including Command & Control (C2), Early Warning and Propaganda, and hosts Rapid Reaction Capabilities in response to Urgent Needs. This program effort includes architecture engineering and studies, system hardware design and development, software design and integration, and testing and demonstration of capabilities to provide disruption of satellite communications signals.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

Bounty Hunter (BH) is a ground-based, deployable, tactical Space Electronic Warfare (ES) system that provides SATCOM geolocation and interference detection capabilities that support the Defensive Space Control of US systems in a specific AOR. BH provides the capability to monitor, detect, characterize and geolocate friendly and unfriendly electro-magnetic interference (EMI) across multiple radio frequency bands in support of Command, Control, Communications, Computers, and Intelligence (C4I) systems by US Joint forces. Continuing annual agile development is needed to meet new user needs in an ever changing threat environment.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Bounty Hunter capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605829F. In FY2020 0.060M expended and in FY2021 0.147M is estimated for civilian pay expenses in this program element.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*

The FY 2022 funding request was reduced by 2.205 million to account for the availability of prior year execution balances.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	54.689	44.709	0.000	44.709
Current President's Budget	0.000	57.189	38.063	0.000	38.063
Total Adjustments	0.000	2.500	-6.646	0.000	-6.646
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	2.500			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-6.646	0.000	-6.646

Change Summary Explanation

FY 2021: +$2.500M for Bounty Hunter expansion
FY 2021: -$1.749M due to SBIR
FY 2022: -$3.970M from JETSS due to higher USSF priorities
FY 2022: -$2.205M due to execution
FY 2022: -$0.471M due to inflation adjustments

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / *Counterspace Systems*	Project (Number/Name) 65A001 / *Counter Satellite Communications System*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
65A001: *Counter Satellite Communications System*	-	0.000	50.453	33.438	0.000	33.438	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Acquisition Decision Memorandum (ADM) April 24th 2009, directed all capabilities identified in the Oct 4th 2006 CCS Block 20, Joint Requirements Oversight Council (JROC) approved Capability Development Document (CDD) shall be accomplished as Pre-planned Product Improvement Program (P3I) upgrades to the Counter Communications System (CCS) Block 10. On April 11th 2016, Air Force Space Command (AFSPC) signed and updated ADM adding additional responsibility for CCS Block 10.3 Meadowlands.

CCS provides expeditionary, deployable, reversible offensive space control (OCS) effects applicable across the full spectrum of conflict. It prevents adversary Satellite Communications (SATCOM) in Area of Responsibility (AOR) including Command & Control (C2), Early Warning and Propaganda, and hosts Rapid Reaction Capabilities in response to Urgent Needs. This program effort includes architecture engineering and studies, system hardware design and development, software design and integration, and testing and demonstration of capabilities to provide disruption of satellite communications signals.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Counter Communications System (CCS) Pre-planned Product Improvement (P3I) Program	-	50.453	33.438	-	33.438
Description: Develop, integrate, test and field the CCS P3I program. This is an incremental approach to deliver Block 20 CCS capabilities. ***FY 2021 Plans:*** Continue P3I development, integration and testing of the Block 10 P3I Meadowlands program. Include additional CCS Block 20 capabilities in CCS Block 10.3 Meadowlands, design forward garrison systems, mission specific emulators, training environment and multi-range integration. Accelerate development of new mission techniques to meet advancing threat and integrates techniques into the CCS program of record. Begin implementation of Agile development approach for development of weapon system software. Implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*	**Project (Number/Name)** 65A001 / *Counter Satellite Communications System*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. ***FY 2022 Base Plans:*** Continue P3I development, integration and testing of the Block 10 P3I Meadowlands program. Include additional CCS Block 20 capabilities in CCS Block 10.3 Meadowlands, design forward garrison systems, mission specific emulators, training environment and multi-range integration. Accelerate development of new mission techniques to meet advancing threat and integrate techniques into the CCS program of record. Continue Agile development approach for development of weapon system software and mission techniques. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc. Implement system resiliency and situational awareness necessary to operate in the contested space domain. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to the ramp down of CCS Meadowlands development.					
Accomplishments/Planned Programs Subtotals	-	50.453	33.438	-	33.438

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPAF 01 CTRSPC: *Counterspace Systems*	0.000	44.156	60.000	-	60.000	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

All contracts in this program element will be awarded using competitive procedures to the maximum extent possible, to upgrade existing capabilities as well as to acquire next generation capabilities through incremental acquisitions.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / *Counterspace Systems*	Project (Number/Name) 65A001 / *Counter Satellite Communications System*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Block 10 P3I Development	Various	Various : El Segundo, CA	-	-		38.160	Feb 2021	24.937	Dec 2021	-		24.937	-	-	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-		0.796	Oct 2020	0.726	Oct 2021	-		0.726	-	-	-
Enterprise Systems Engineering and Integration	C/FFP	AT&T : El Segundo, CA	-	-		0.929	May 2021	0.198	May 2022	-		0.198	-	-	-
Counterspace Architecture Development	C/CPFF	NGMS : Redondo Beach, CA	-	-		0.966	Jan 2021	0.908	Jan 2022	-		0.908	-	-	-
		Subtotal	-	-		40.851		26.769		-		26.769	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Security	C/CPAF	Mantech : El Segundo, CA	-	-		2.263	Nov 2020	2.304	Nov 2021	-		2.304	-	-	-
		Subtotal	-	-		2.263		2.304		-		2.304	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace Corp : El Segundo, CA	-	-		0.772	Oct 2020	0.786	Oct 2021	-		0.786	-	-	-
A&AS	Various	Various : El Segundo, CA	-	-		6.496	May 2021	3.481	May 2022	-		3.481	-	-	-
Other Support	Various	Various : El Segundo, CA	-	-		0.071	Oct 2020	0.098	Oct 2021	-		0.098	-	-	-
		Subtotal	-	-		7.339		4.365		-		4.365	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / *Counterspace Systems*	Project (Number/Name) 65A001 / *Counter Satellite Communications System*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		50.453		33.438		-		33.438	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*	**Project (Number/Name)** 65A001 / *Counter Satellite Communications System*

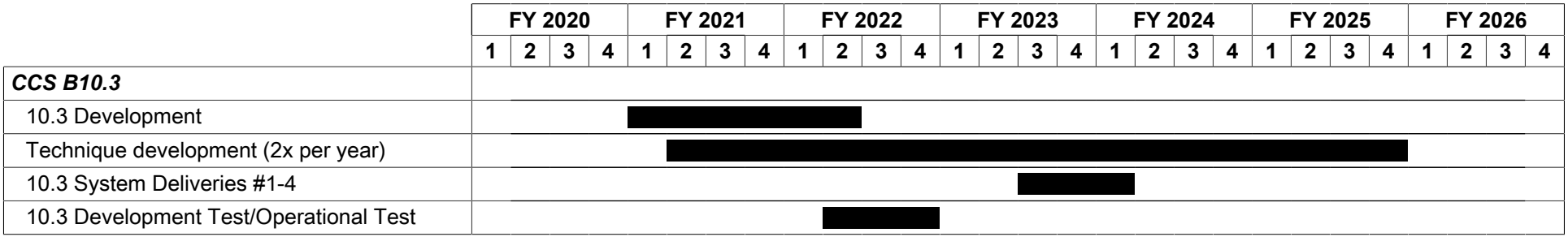

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*	**Project (Number/Name)** 65A001 / *Counter Satellite Communications System*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
CCS B10.3				
10.3 Development	1	2021	2	2022
Technique development (2x per year)	2	2021	4	2025
10.3 System Deliveries #1-4	3	2023	1	2024
10.3 Development Test/Operational Test	2	2022	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / *Counterspace Systems*	Project (Number/Name) 65A005 / *Offensive Counterspace (OCS) C2*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
65A005: *Offensive Counterspace (OCS) C2*	-	0.000	2.252	2.619	0.000	2.619	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This effort supports the evolution of command and control (C2) and mission planning capabilities in support of the fielding and employment of Counterspace Systems. It provides for the integration and upgrade of collaborative tools to link deployable counterspace systems with Joint Warfighting C2 systems and to enable integrated planning and execution of the counterspace mission. Upgraded capabilities will be integrated into current and future command and control systems. This program will leverage the Joint Execution and Tasking System for Space (JETSS) effort in C2 for future space control and counterspace mission capabilities. Requirements for this program are derived from Space Force Headquarters prioritized requirements, in accordance with AFSPC 63-104.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Joint Execution and Tasking System for Space (JETSS)	-	2.252	2.619	0.000	2.619
Description: Evolve with upgrades the counterspace mission planning and C2 capability to support counterspace systems space control warfighter activities.					
FY 2021 Plans: Develop product line for higher protection level to support multiple classification levels, risk reduction efforts, and provide upgraded capabilities to support evolutionary C2 initiatives, Counterspace Operations for Combined Space Operations Center (CSpOC) and National Space Defense Center (NSDC), and integration into Battle Management Command and Control (BMC2). Implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue program office and other related activities that may include, but are not limited to studies, technical analysis, prototyping, etc.					
FY 2022 Base Plans: Accelerate the completion of integration into BMC2, upgrading Space Electronic Warfare C2 capabilities at multiple classification levels for CSpOC and tactical units. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc.					
FY 2022 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*	**Project (Number/Name)** 65A005 / *Offensive Counterspace (OCS) C2*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 to accelerate integration into Space C2.					
Accomplishments/Planned Programs Subtotals	-	2.252	2.619	0.000	2.619

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

All contracts will be awarded using competitive procedures to the maximum extent possible to acquire next generation capabilities through incremental acquisitions. Beginning in FY 2022, Offensive Counterspace (OCS) C2 project efforts will be included in the acquisition strategy for Space C2 program.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / *Counterspace Systems*	Project (Number/Name) 65A005 / *Offensive Counterspace (OCS) C2*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Develop Counterspace Planning and C2 System (JETSS)	C/CPIF	L3Harris : Colorado Springs, CO	-	-		1.217	Dec 2020	2.050	Dec 2021	-		2.050	-	-	-
		Subtotal	-	-		1.217		2.050		-		2.050	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	C/CPFF	Various : Various	-	-		1.001	May 2021	0.534	May 2022	-		0.534	-	-	-
Other Support	C/Various	Various : Various	-	-		0.034	Oct 2020	0.035	Oct 2021	-		0.035	-	-	-
		Subtotal	-	-		1.035		0.569		-		0.569	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		2.252		2.619		-		2.619	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*	**Project (Number/Name)** 65A005 / *Offensive Counterspace (OCS) C2*

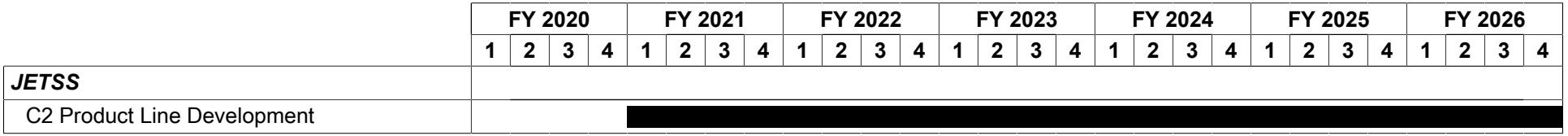

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*	**Project (Number/Name)** 65A005 / *Offensive Counterspace (OCS) C2*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
JETSS				
C2 Product Line Development	1	2021	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / *Counterspace Systems*	Project (Number/Name) 65A013 / *BOUNTY HUNTER*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
65A013: *BOUNTY HUNTER*	-	0.000	4.484	2.006	0.000	2.006	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Bounty Hunter (BH) is a ground-based, deployable, tactical Space Electronic Warfare (ES) system that provides SATCOM geolocation and interference detection capabilities that support the Defensive Space Control of US systems in a specific AOR. BH provides the capability to monitor, detect, characterize and geolocate friendly and unfriendly electro-magnetic interference (EMI) across multiple radio frequency bands in support of Command, Control, Communications, Computers, and Intelligence (C4I) systems by US Joint forces. Continuing annual agile development is needed to meet new user needs in an ever changing threat environment.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Bounty Hunter capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605829F. In FY2020 $0.060M expended and in FY2021 $0.147M is estimated for civilian pay expenses in this program element.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Bounty Hunter	-	4.484	2.006	-	2.006
Description: Develop new capabilities for the Bounty Hunter program to meet and maintain pace with the operational threat environment. Specific accomplishments are classified.					
FY 2021 Plans: Resolve any new technical obsolescence hardware (HW) and software (SW) challenges with new system component purchases for additional new system delivery to a new AOR. Prepare RDT&E plan for new system upgrade to BH 3.0 to allow for system component consolidation and remote operation in specific Combatant Command (CCMD) Areas of Responsibility (AOR). Reach and maintain pace with the threat environment and implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue transition of post-Technical Readiness Level (TRL) 6 and above RDT&E activities from MITRE to our BH Systems contractor. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.					
FY 2022 Base Plans: Continue to resolve any new technical obsolescence HW and SW challenges with new system component purchases for additional new system delivery as directed by the US Space Force. Finalize execution of the program R&DTE plan for system upgrade to BH 3.0 to allow for system component consolidation and completion of remote operations in specific CCMD AOR's. Reach and maintain pace with the threat environment and					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*	**Project (Number/Name)** 65A013 / *BOUNTY HUNTER*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
implement system resiliency and situational awareness necessary to operate in the contested space domain. Complete transition of all post-TRL 6 and above RDT&E activities from MITRE to the BH Systems contractor. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY2022 increased compared to FY2021 as explained above.					
Accomplishments/Planned Programs Subtotals	-	4.484	2.006	-	2.006

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPAF 01 CTRSPC: *Counterspace Systems*	-	4.988	5.030	-	5.030	-	-	-	-	-	-

Remarks

BH was established in FY16 as a JCTD project in response to a JUON in 2010. BH was established as a Program of Record (PoR) in March 2019.

D. Acquisition Strategy

Contracts funded for this program shall be awarded to MITRE, a Federally Funded Research and Development Center (FFRDC), and the commercial vendor COLSA Corporation.

**2026 Continuous Delivery (SW & HW updates) Start 2nd qtr 2026 - End 1st qtr 2027

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206421SF / *Counterspace Systems*	Project (Number/Name) 65A013 / *BOUNTY HUNTER*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Bounty Hunter Agile Development	SS/CPAF	MITRE : Colorado Springs, CO	-	-		0.991	Oct 2020	1.147	Oct 2021	-		1.147	-	-	-
Bounty Hunter Development	SS/CPFF	COLSA : Huntsville, AL	-	-		3.346	Mar 2021	0.859	Mar 2022	-		0.859	-	-	-
		Subtotal	-	-		4.337		2.006		-		2.006	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Bounty Hunter Civilian Pay DCA	TBD	USAF : Hanscom SFB, MA	-	-		0.147	Oct 2020	-		-		-	-	-	-
		Subtotal	-	-		0.147		-		-		-	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		4.484		2.006		-		2.006	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*	**Project (Number/Name)** 65A013 / *BOUNTY HUNTER*

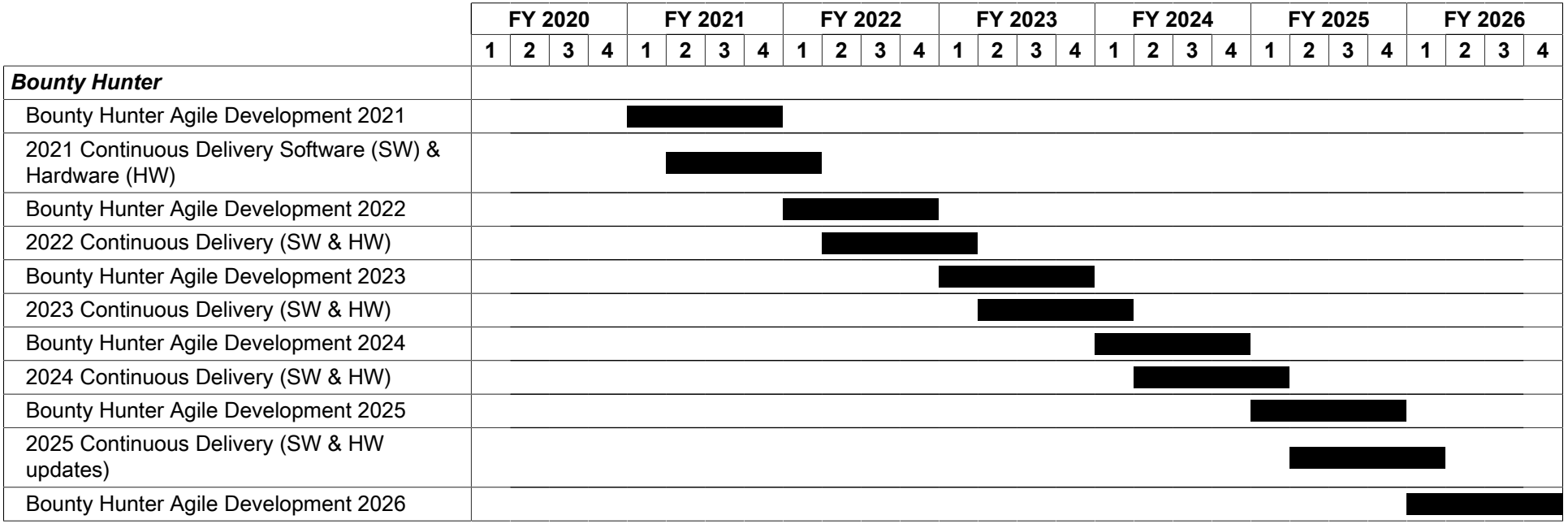

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206421SF / *Counterspace Systems*	**Project (Number/Name)** 65A013 / *BOUNTY HUNTER*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Bounty Hunter				
Bounty Hunter Agile Development 2021	1	2021	4	2021
2021 Continuous Delivery Software (SW) & Hardware (HW)	2	2021	1	2022
Bounty Hunter Agile Development 2022	1	2022	4	2022
2022 Continuous Delivery (SW & HW)	2	2022	1	2023
Bounty Hunter Agile Development 2023	1	2023	4	2023
2023 Continuous Delivery (SW & HW)	2	2023	1	2024
Bounty Hunter Agile Development 2024	1	2024	4	2024
2024 Continuous Delivery (SW & HW)	2	2024	1	2025
Bounty Hunter Agile Development 2025	1	2025	4	2025
2025 Continuous Delivery (SW & HW updates)	2	2025	1	2026
Bounty Hunter Agile Development 2026	1	2026	4	2026

Note

**2026 Continuous Delivery (SW & HW updates) Start 2 qtr 2026 - End 1st qtr 2027

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206422SF *I Weather System Follow-on*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	2.526	1.438	0.000	1.438	-	-	-	-	-	-
65A038: *SSA Environmental Monitoring*	-	0.000	2.526	1.438	0.000	1.438	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Space Situational Awareness Environmental Monitoring (SSAEM) program is a non-ACAT, Class D technology demonstration project to support the international Constellation Observing System for Meteorology, Ionosphere and Climate 2 (COSMIC-2) mission. The SSAEM program provides the acquisition, development and launch/on-orbit support of 18 space/terrestrial weather sensors to COSMIC-2 partnership in coordination with National Oceanic and Atmospheric Administration (NOAA) and Taiwan's National Space Organization (NSPO). COSMIC-2 is launching six satellites in an equatorial, Low Earth Orbit (LEO) with 3 SSAEM sensors in each spacecraft by FY 2019. The sensor types are Tri-Global Navigation Satellite System (Tri-GNSS) Radio occultation System (TGRS), Ion Velocity Meter (IVM) and Radio Frequency Beacon (RFB). The SSAEM sensors will address three distinct Joint Requirement Oversight Committee (JROC)-approved Category A weather gaps, specifically Gap #4 (Ionospheric Density), Gap #7 (Equatorial Ionospheric Scintillation) and Gap #12 (Electric Field), to provide additional space meteorological data to improve forecast capabilities and improve warfighter navigation/communication capabilities.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

The FY 2022 funding request was reduced by 1.127 million to account for the availability of prior year execution balances.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver WSF weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206422SF *I Weather System Follow-on*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	2.526	2.583	0.000	2.583
Current President's Budget	0.000	2.526	1.438	0.000	1.438
Total Adjustments	0.000	0.000	-1.145	0.000	-1.145
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-1.145	0.000	-1.145

Change Summary Explanation

FY 2022:-$1.127M for underexecution; -$0.018M inflation adjustment.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Situational Awareness Environment Monitoring (SSAEM)	0.000	2.526	1.438

Description: The SSAEM program is a non-ACAT, Class D technology demonstration project to support international Constellation Observing System for Meteorology, Ionosphere and Climate 2 (COSMIC-2) mission. The SSAEM program provides the acquisition, development and launch/on-orbit support of 18 space/terrestrial weather sensors to COSMIC-2 partnership in coordination with National Oceanic and Atmospheric Administration (NOAA) and Taiwan's National Space Organization (NSPO). On June 25th, 2019 COSMIC-2 successfully launched six satellites in an equatorial, Low Earth Orbit (LEO) with 3 SSAEM sensors in each spacecraft. The sensor types are; Tri-GNSS Radio occultation System (TGRS), Ion Velocity Meter (IVM) and Radio Frequency Beacon (RFB). The SSAEM sensors will address three distinct Joint Requirement Oversight Committee (JROC)-approved Category A weather gaps, specifically Gap 4 (Ionospheric Density), 7 (Equatorial Ionospheric Scintillation) and 12 (Electric Field), to provide additional space meteorological data to improve forecast capabilities and improve warfighter navigation/ communication capabilities.

FY 2021 Plans:

Complete sensor data cal/val effort for all three sensor types. Start RF Beacon ground receiver cyber hardening and fielding activities for connecting with Ionospheric Scintillation Total Electron Count (TEC) observer (ISTO) sites. Provide continuous on-orbit sensors health check and anomaly resolution support until the satellites reach their designed mission EoL. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.

FY 2022 Plans:

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206422SF *I Weather System Follow-on*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue Radio Frequency Beacon receivers (RFBr) fielding activities at operational Ionospheric Scintillation and Total Electron Content Observer (ISTO) sites. Continue on-orbit support of SSAEM sensors onboard COSMIC-2 as well as provide remote sensing of space weather coverage until the satellites reach their design mission End of Life. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 funding decreased for underexecution			
Accomplishments/Planned Programs Subtotals	0.000	2.526	1.438

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

SSAEM post-launch and cal/val support contract is the sole-source contract to University Corporation Atmospheric Research due to their expertise in radio occultation and space weather monitoring for SSAEM sensors. The Justification & Approval (J&A) was approved in June 2018 and the Request for Proposal was released on August 1st, 2018. The contract was awarded in July 2019 for 5-years of post-launch cal/val and on-orbit support.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206422SF / *Weather System Follow-on*	Project (Number/Name) 65A038 / *SSA Environmental Monitoring*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
UCAR Sensor R&D	SS/CPFF	UCAR : TBD	-	-		0.711	Nov 2020	0.759	Nov 2021	-		0.759	-	-	-
On-Orbit Support (UCAR/ JPL)	MIPR	UCAR/JPL : Boulder, CO	-	-		0.538	Nov 2020	0.440	Nov 2021	-		0.440	-	-	-
Ground Support	Various	Various : TBD	-	-		0.171	Nov 2020	0.000	Nov 2021	-		0.000	-	-	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-		0.394	Oct 2020	0.115	Nov 2021	-		0.115	-	-	-
		Subtotal	-	-		1.814		1.314		-		1.314	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace Corp : El Segundo, CA	-	-		0.640	Nov 2020	0.115	Nov 2021	-		0.115	-	-	-
Other Support	Various	Various : Various	-	-		0.072		0.009		-		0.009	-	-	-
		Subtotal	-	-		0.712		0.124		-		0.124	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		2.526		1.438		-		1.438	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206422SF / *Weather System Follow-on*	**Project (Number/Name)** 65A038 / *SSA Environmental Monitoring*

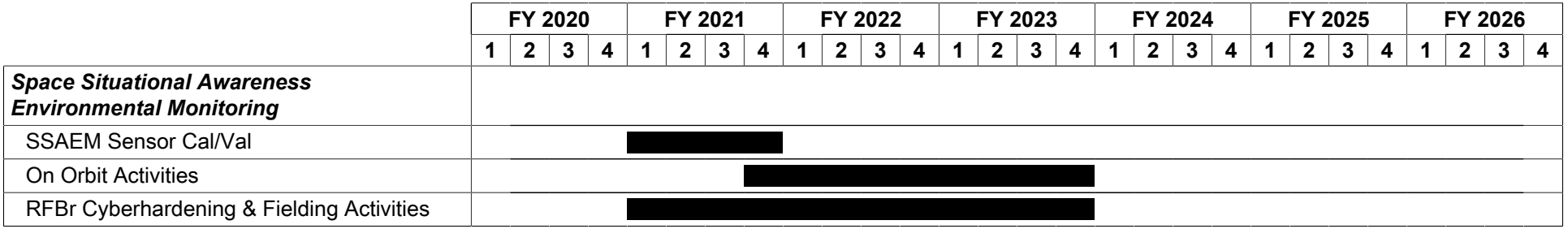

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206422SF / *Weather System Follow-on*	**Project (Number/Name)** 65A038 / *SSA Environmental Monitoring*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Space Situational Awareness Environmental Monitoring				
SSAEM Sensor Cal/Val	1	2021	4	2021
On Orbit Activities	4	2021	4	2023
RFBr Cyberhardening & Fielding Activities	1	2021	4	2023

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206425SF / *Space Situation Awareness Systems*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	173.074	127.026	0.000	127.026	-	-	-	-	-	-
65A006: *Space Based Space Surveillance*	-	0.000	173.074	127.026	0.000	127.026	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Space Domain Awareness (SDA) is one of five core competencies of the Space Force and is the effective identification, characterization, and understanding of any factor, passive or active, associated with the space domain that could affect space operations and thereby impact the security, safety, economy, or environment of our nation. As the foundation for space control, SDA encompasses surveillance of all space objects and activities; detailed surveillance of specific space assets; monitoring space environmental conditions; monitoring cooperative space assets; gathering indications and warning on adversary space operations; and conducting integrated command, control, communications, processing, analysis, dissemination, and archiving activities.

This program element develops new network sensors and improved information integration capabilities across the space surveillance network (SSN) while companion program element 1203940SF fields, upgrades, operationalizes, operates, and maintains Space Force sensors and information integration capabilities within the SSN. Activities funded in this program element (1206425SF) also support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, modernization initiatives, systems engineering, system development, and test & evaluation, and may include prototyping and technology demonstration.

The Space-Based Space Surveillance (SBSS) Block 10 satellite was launched September 2010 with a design life through 2017 and an extended operational capability through 2020. The SBSS Follow-On (SBSS FO) program will develop and deliver a system to continue providing space object surveillance from space beyond SBSS Block 10 End-of-Life. The United States Space Force (USSF) and National Reconnaissance Office (NRO) have signed a Memorandum of Agreement partnering SBSS FO with an NRO program based on overlapping requirements. The new partner program is called SILENTBARKER. SILENTBARKER enables timely detection and custody of on orbit threats in order to protect US High Value Assets in space in support of the National Defense Strategy.

SILENTBARKER requirements are based on a Statement of Capabilities and upon the current Space Domain Awareness (SDA) Initial Capabilities Document architectural requirements focused on protecting High Value Assets. SILENTBARKER will provide the capability to search, detect, and track objects from a space-based sensor for timely custody and event detection. Surveillance from space augments and overcomes existing ground sensor limitations with timely 24-hour above-the-weather collection of satellite metric data only possible with a space-based sensor. This data is communicated to operators at the Combined Space Operations Center (CSpOC), National Space Defense Center (NSDC), and other classified users. This program element includes efforts related to SILENTBARKER, its integration into the broader space superiority architecture, and analysis and experimentation to ensure space-based space surveillance capabilities against the evolving threat.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206425SF / *Space Situation Awareness Systems*

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary emergent or unanticipated civilian pay expenses required to manage, execute, and deliver SILENTBARKER for emergent or unanticipated weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 69999F. In PY $.06M and in CY $.220M was expended for civilian pay expenses in this program element.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	173.074	310.602	0.000	310.602
Current President's Budget	0.000	173.074	127.026	0.000	127.026
Total Adjustments	0.000	0.000	-183.576	0.000	-183.576
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-183.576	0.000	-183.576

Change Summary Explanation

FY 2022: $183.1M decrease; launch for expansion re-phased to FY 2024 and transferred to National Security Space Launch ($182M, NSSL, PE 1203953SF), reduced $1.1M to account for inflation.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: SBSS Follow-On (SBSS FO) Design & Development	-	173.074	127.026
Description: Performs space based SDA analysis, research, and development for the SILENTBARKER system in partnership with the NRO.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206425SF *I Space Situation Awareness Systems*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: Continue to support SILENTBARKER partner integration and test phase. Prepare for and conduct Test Readiness Review (TRR) prior to deployment. Enhances space environmental monitoring solutions. Continue SILENTBARKER constellation assets to expand coverage for deep space SDA. Continue implementation of ground mission data processing and data dissemination efforts in support of SILENTBARKER ground requirements. Conduct System Requirements Review (SRR) for expansion effort. Identify requirements and technology enhancements to ensure space-based space surveillance capabilities against the evolving threat for future upgrades, extensions, and augmentations. ***FY 2022 Plans:*** Prepare for and conduct Pre-Ship Review (PSR) in preparation for launch of the first increment. Continue development of SILENTBARKER expansion assets to increase coverage for deep space SDA. Conduct Critical Design Review (CDR) for expansion effort. Continue implementation of ground mission data processing and data dissemination efforts in support of SILENTBARKER ground requirements. Establish requirements and technology enhancements to ensure space-based space surveillance capabilities against the evolving threat for future upgrades, extensions, and augmentations through analysis, prototyping, and experimentation. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and affordable prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased from FY 2021 due to the transfer of launch funds to the NSSL program and the annually allocated amounts fluctuate per the 50/50 cost sharing USSF-NRO Interagency Agreement.			
Accomplishments/Planned Programs Subtotals	-	173.074	127.026

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

The Acquisition Strategy was approved to minimize the space-based SDA gap post-SBSS Block 10. SILENTBARKER anticipates Initial Launch Capability in FY 2023. The SBSS FO Materiel Development Decision was approved by the Milestone Decision Authority (MDA) on April 5, 2016. The Acquisition Strategy Panel was completed with the MDA on August 29, 2016. To satisfy the SDA architecture needs, the SBSS FO program requirements combined with an NRO program and were updated in the

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206425SF *I Space Situation Awareness Systems*

December 2017 SILENTBARKER Statement of Capabilities. The SBSS FO program remains a Space Force program, but will leverage NRO processes to fulfill SBSS FO space segment and telemetry, tracking, and commanding (TT&C) program segments in order to further National Security Space objectives. Mutual investment for the non-recurring engineering (NRE) cost enables the potential for a larger initial constellation buy and lower unit costs. The Space Force and NRO are implementing the approach to meet mission processing requirements, develop the ground architecture, and extend capabilities beyond FY 2022.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206425SF / *Space Situation Awarenes s Systems*	**Project (Number/Name)** 65A006 / *Space Based Space Surveillance*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SBSS Follow On Prime Development	MIPR	Various : Various	-	-		147.812	Nov 2020	104.933	Dec 2021	-		104.933	-	-	-
Technical Mission Analysis	Various	Various : Various, CA	-	-		1.965	Jan 2021	0.900	Nov 2021	-		0.900	-	-	-
Enterprise SE&I	Various	Various : Various	-	-		1.699	Dec 2020	1.600	Nov 2021	-		1.600	-	-	-
		Subtotal	-	-		151.476		107.433		-		107.433	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace Corp : Los Angeles, CA	-	-		0.887	Dec 2020	0.900	Nov 2021	-		0.900	-	-	-
A&AS	Various	Various : CA	-	-		20.587	Jan 2021	18.373	Jan 2022	-		18.373	-	-	-
Other Support	Various	Various : Various	-	-		0.124	Mar 2021	0.320	Mar 2022	-		0.320	-	-	-
		Subtotal	-	-		21.598		19.593		-		19.593	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		173.074		127.026		-		127.026	-	-	N/A

Remarks

The SBSS FO project has very minimal organic Space Force resources. The FY 2022 Management Services includes support to parallel efforts for both the SBSS FO and SBSS FO Expansion, including preparations for SBSS FO launch and design reviews for SBSS FO. Additionally, non-recurring engineering investments require increased assistance and advisory services to enable integration of data products between intelligence community and Space Force infrastructure until integration is mature and stable.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206425SF / *Space Situation Awarenes s Systems*	**Project (Number/Name)** 65A006 / *Space Based Space Surveillance*

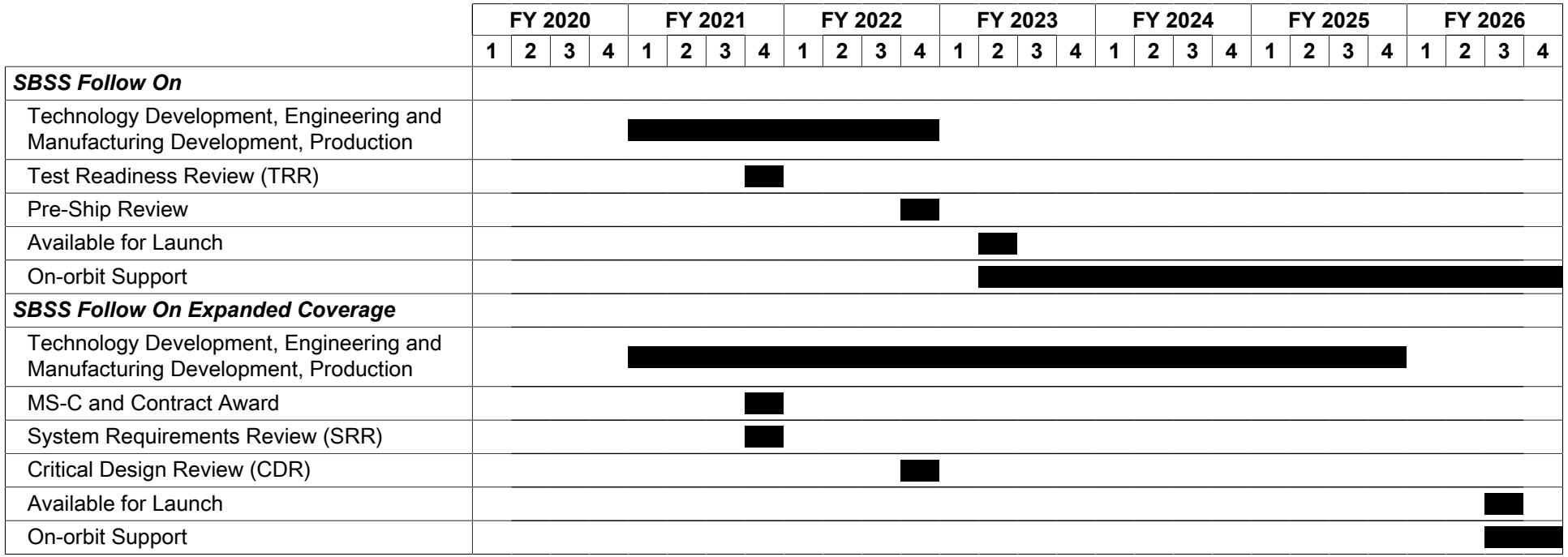

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206425SF / *Space Situation Awarenes s Systems*	**Project (Number/Name)** 65A006 / *Space Based Space Surveillance*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
SBSS Follow On				
Technology Development, Engineering and Manufacturing Development, Production	1	2021	4	2022
Test Readiness Review (TRR)	4	2021	4	2021
Pre-Ship Review	4	2022	4	2022
Available for Launch	2	2023	2	2023
On-orbit Support	2	2023	4	2026
SBSS Follow On Expanded Coverage				
Technology Development, Engineering and Manufacturing Development, Production	1	2021	4	2025
MS-C and Contract Award	4	2021	4	2021
System Requirements Review (SRR)	4	2021	4	2021
Critical Design Review (CDR)	4	2022	4	2022
Available for Launch	3	2026	3	2026
On-orbit Support	3	2026	4	2026

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206431SF *I Advanced EHF MILSATCOM (SPACE)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	90.045	28.218	0.000	28.218	-	-	-	-	-	-
657104: *MILSATCOM Space Modernization Initiative (SMI)*	-	0.000	90.045	28.218	0.000	28.218	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

In FY 2021 Appropriations, Congress directed the transfer of PE 1206431SF, Advanced EHF MILSATCOM (Space), Project 657104, MILSATCOM SMI, Fighting SATCOM efforts to PE 1206445SF, COMSATCOM Integration, Project 650140, COMSATCOM, Enterprise Integration of Fighting SATCOM efforts to provide increased transparency.
In FY 2022, PE 1206431SF, Advanced EHF MILSATCOM (SPACE), Project 657104, MILSATCOM SMI, Protected Tactical Testbed efforts were transferred to PE 1206761SF, Protected Tactical Service (PTS), Project 643728, Protected Tactical SATCOM, in order to better align the testbed with the family of programs it will support in the Future Years Defense Program (FYDP).

A. Mission Description and Budget Item Justification

The Space Modernization Initiative (SMI) evolves current and future SATCOM systems to develop a more affordable and resilient integrated enterprise capable of meeting near-term and emerging requirements. Under this construct, SMI will continue the Capabilities Insertion Program (CIP) to enhance the current Advanced Extremely High Frequency (AEHF) constellation and Protected Communications performance to improve system operational resiliency. Additionally, SMI will demonstrate technologies and Concepts of Operations (CONOPS) that lead to a Protected Anti-Jam Tactical SATCOM (PATS) capability that provides tactical-level military SATCOM (MILSATCOM) users protected, anti-jam SATCOM while operating in a contested environment.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

The FY 2022 funding request was reduced by $7.893 million to account for the availability of prior year execution balances.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver AEHF and SMI capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206431SF *I Advanced EHF MILSATCOM (SPACE)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	138.257	95.856	0.000	95.856
Current President's Budget	0.000	90.045	28.218	0.000	28.218
Total Adjustments	0.000	-48.212	-67.638	0.000	-67.638
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-5.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	-43.212			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-67.638	0.000	-67.638

Change Summary Explanation

FY 2021: -$5.000M Congressional Reduction for program delays; -$43.212M Congressional Directed Transfer to PE 1206445SF, COMSATCOM Integration for Enterprise Integration of Fighting SATCOM.

FY 2022: +$9.400M for A3M Development; -$54.050M for higher USSF priorities; -$14.745M, transferred Protected Tactical Testbed to PE 1206761SF, Protected Tactical Service (PTS); -$7.893M to account for the availability of prior year execution balances; -$0.098M for inflation adjustment.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Capabilities Insertion Program (CIP)	0.000	61.514	12.826

Description: Develop software that will increase the current AEHF constellation and Protected Communications capabilities, broaden overall user base, and accommodate a larger user population through improved resource utilization efficiencies. Develop modifications that will improve the Protected mission operational resiliency. Develop software to increase current AEHF terminal data rates with adaptive coding algorithms. Invest in technology demonstrations that improve the operational mission resiliency and effectiveness for all protected capabilities, which include, but are not limited to, Rapid Adaptive Planning and Situational Awareness for the Warfighter (RAPSAW), Mission Planning Element (MPE) 8.4, and Cyber Defense-in-depth.

FY 2021 Plans:

Continue Operational Resiliency (OR) 2/2B Phase 2, which adds capability to constellation and ground software updates. Other continuing projects include the RAPSAW resiliency effort that decreases the mission planning timelines, de-conflicts communication planning for the operators, and provides enhanced situational awareness of payload and terminal resources; MPE 8.4 - a capability improvement to the AEHF system that improves the Wideband EHF Beyond-Line-of-Sight Terminal (WEB-T) functionality and crypto redesign; and Cyber Defense-in-depth - that will deliver new system enhancements and upgrades to

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206431SF *I Advanced EHF MILSATCOM (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
fortify AEHF against cyber security threats. This will provide new capabilities and functionality for defensive cyber operation and hardening against cyber-attacks on orbit and on the ground. Invest in technology demonstrations that improve operational mission resiliency and effectiveness for all protected capabilities. These activities include, but are not limited to W/V Frequency utility, etc. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Complete OR 2/2B Phase 2 ground software updates. Complete MPE 8.4 capability improvements to the AEHF system functionality and crypto design. Complete W/V Frequency utility assessments and demonstrations. Additionally, FY 2022 funding will allow the program to implement system resiliency necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 funds decreased due to completion of MPE 8.4 capability improvements and OR 2/2B Phase 2 ground software updates.			
Title: Protected Tactical Testbed	0.000	6.952	0.000
Description: Protected Tactical Testbed provides a government gold standard of reference for risk reduction and experimentation on critical technology elements for the space payload, terminals, and networking segments of the PATS system. Supports the hardware development of the hub component for the PTES ground system and any necessary test capabilities to support either the over-the-air (OTA) or laboratory demonstrations for the Protected Tactical Service Field Demonstration (PTSFD). Enables system integration capabilities with industry and FFRDC partners for interoperability testing and conducting experiments to mature the PATS operations with a focus on the Protected Tactical Waveform (PTW). This effort is planned to move to PE 1206761SF, Protected Tactical Service (PTS) in FY 2022. ***FY 2021 Plans:*** During Protected Tactical Enterprise Service (PTES) Phase I, testbed assets will continue to be developed and procured to support the PATS mission. Continue Testbed support to PTES Operational Demonstration and PTES extensibility to PTS. PTES, PTS and Army-Air Force Anti-Jam Modem (A3M) will utilize the test assets to develop Key Management Systems (KMS), Mission Management Systems (MMS), Joint Hub, Space Hub, and Terminal Modem Line Replacement Unit (TM LRU), and Terminal / Hub capability in support of risk reduction events and testing of numerous over-the-air, interoperability demonstrations, is planned to include: a) demonstration of PTW of Kirameki Satellites (in cooperation with Japan) which will mature International Partner user CONOPS within PATS; b) maturation and demonstration of Enterprise Management and Control functions while roaming between MILSATCOM and commercial SATCOM (COMSATCOM) systems; and c) participation in Navy Trident Warrior exercise which			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206431SF *I Advanced EHF MILSATCOM (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
helps mature PTW Combatant Command CONOPS. Protected Tactical Testbed is planned to move to PE 1206761SF, PTS in FY 2022. ***FY 2022 Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 funds decreased due to budget transfer to PE 1206761SF, PTS.			
Title: Air Force - Army Anti-Jam Modem (A3M) ***Description:*** The A3M will develop PTW modems that meet all environmental, integration, and mission requirements for the Satellite Transportable Terminal (STT), Ground Multi-band Terminal (GMT), and other Combat Communications tactical users. A3M development includes fabrication of pre-production modems, development of operator training materials, fielding, and sustainment planning. A3M is dependent on the PTES development and delivery of a production representative ground hub to connect to and perform an Operational Assessment (OA) of the pre-production modems to inform the Milestone C production decision. A3M pre-production modems are 100% production ready and support PTES Minimum Viable Product (MVP) goals. A3M OA testing reduces risk for the PTES Multi-service Operational Test and Evaluation (MOT&E) for IOC. ***FY 2021 Plans:*** Continue modem development, conduct Critical Design Reviews (CDR), fabrication of pre-production modems and developmental testing including National Cyber Range (NCR), blue and red team testing. Continue GMT modification preparation, cable design, and non-recurring engineering. ***FY 2022 Plans:*** Complete CDR and fabrication of pre-production units. Test in an operational representative environment during the OA. The OA will inform the production decision for Milestone C. Complete PATS Risk Reduction Demonstrations (RRD) and Integration Events (IE). Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 funds increased due to continued A3M Block II Development and Production, and operational assessments.	0.000	21.579	15.392
Accomplishments/Planned Programs Subtotals	0.000	90.045	28.218

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206431SF *I Advanced EHF MILSATCOM (SPACE)*

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPSF 01 ADV555: *Advanced EHF*	-	7.823	-	-	-	-	-	-	-	-	-
• SPSF 01 MILSAT: *MILSATCOM*	-	4.518	13.978	-	13.978	-	-	-	-	-	-

Remarks

The FY21-26 MILSAT SPSF above funds the production of the A3M. A3M is a joint effort between the MILSATCOM Directorate (SMC) and the Program Manager (PM) Tactical Networks (TN), Aberdeen Proving Ground (APG), to develop a common modem for the AF GMT and Army STT. Leveraging similar mission and environmental requirements enables selection of the high water mark requirements to meet both mission parameters with greater efficiency while reducing risk and lifecycle cost.

E. Acquisition Strategy

A3M is an ACAT III program. A3M leverages the PTSFD technology maturation resulting in a low risk development effort delivering pre-production modems with 100% production ready components. This will include certified End Cryptographic Units (ECUs) for full scope operational and cyber testing, operator and maintainer training materials, and all required intellectual property rights, provisioning documentation, and training materials to enable swift terminal modification for operational use and sustainment. The development phase will deliver pre-production PTW capable modems ready for "build to print" production. Blended developmental and operational testing is expected to include full environmental, blue, and red team testing prior to the production decision.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206431SF / *Advanced EHF MILSATCOM (SPACE)*	**Project (Number/Name)** 657104 / *MILSATCOM Space Modernization Initiative (SMI)*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Capabilities Insertion Program (CIP)	SS/CPFF	Lockheed Martin : Sunnyvale, CA	-	-		47.032	Feb 2021	4.076	Nov 2021	-		4.076	-	-	-
W/V Frequency utilization demonstration	MIPR	AFRL : Various	-	-		8.554	Mar 2021	8.554	Jan 2022	-		8.554	-	-	-
Protected Tactical Testbed	Various	MIT/LL : Hanscom AFB, MA	-	-		6.784	Feb 2021	-		-		-	-	-	-
A3M PTW Modem Development	C/CPAF	Various : Various	-	-		17.037	Feb 2021	11.224	Nov 2021	-		11.224	-	-	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		5.665	Feb 2021	1.000	Nov 2021	-		1.000	-	-	-
Enterprise SE&I	C/CPAF	Linquest : Los Angeles, CA	-	-		3.072	Feb 2021	2.698	Nov 2021	-		2.698	-	-	-
		Subtotal	-	-		88.144		27.552		-		27.552	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	Various : Various	-	-		1.801	Feb 2021	0.566	Oct 2021	-		0.566	-	-	-
Other Support	Various	Various : Various	-	-		0.100	Feb 2021	0.100	Oct 2021	-		0.100	-	-	-
		Subtotal	-	-		1.901		0.666		-		0.666	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		90.045		28.218		-		28.218	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206431SF / *Advanced EHF MILSATCOM (SPACE)*	**Project (Number/Name)** 657104 / *MILSATCOM Space Modernization Initiative (SMI)*

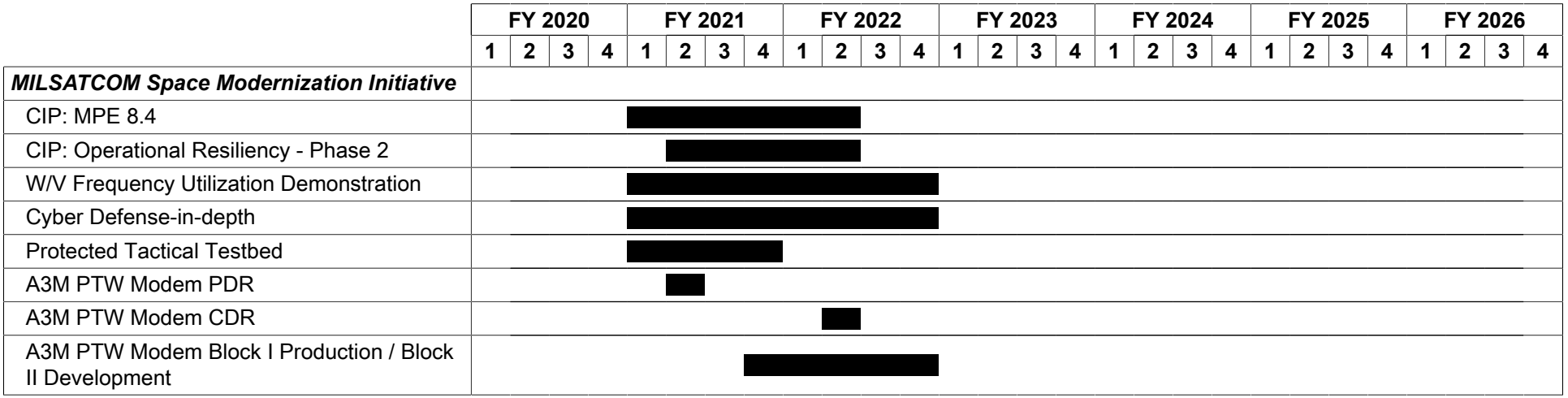

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206431SF / *Advanced EHF MILSATCOM (SPACE)*	**Project (Number/Name)** 657104 / *MILSATCOM Space Modernization Initiative (SMI)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MILSATCOM Space Modernization Initiative				
CIP: MPE 8.4	1	2021	2	2022
CIP: Operational Resiliency - Phase 2	2	2021	2	2022
W/V Frequency Utilization Demonstration	1	2021	4	2022
Cyber Defense-in-depth	1	2021	4	2022
Protected Tactical Testbed	1	2021	4	2021
A3M PTW Modem PDR	2	2021	2	2021
A3M PTW Modem CDR	2	2022	2	2022
A3M PTW Modem Block I Production / Block II Development	4	2021	4	2022

Note

Protected Tactical Testbed effort is transferred in FY 2022 to PE 1206761SF, Protected Tactical Service (PTS).

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206432SF / *Polar MILSATCOM (SPACE)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	190.235	127.870	0.000	127.870	-	-	-	-	-	-
654215: *EPS Recap*	0.000	0.000	190.235	127.870	0.000	127.870	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Program MDAP/MAIS Code: 121												

A. Mission Description and Budget Item Justification

This program element acquires the Polar MILSATCOM system that provides protected communications (anti-jam and low probability of intercept and detection) for users in the North Polar Region.

In FY 2006, the Department of Defense (DoD) began funding Enhanced Polar System (EPS). The host spacecraft and the polar communications packages took advantage of the Advanced Extremely High Frequency (AEHF) technology including the eXtended Data Rate (XDR) waveform. The EPS Capability Development Document (CDD), approved by the Joint Requirements Oversight Council in September 2006, is based on a two-package, hosted XDR program with operational availability in CY 2015 and CY 2017. EPS is comprised of four segments: Payload, Ground Control, Gateway, and Terminal (acquired by each Service's Terminal Program Office). Milestone B review was completed April 2, 2014.

In FY 2019, the United States Air Force (USAF) and Norwegian Ministry of Defense signed the Arctic Memorandum of Agreement, which enforces the international collaboration with Norway to host two EPS-Recapitalization (EPS-R) payloads on Space Norway-procured spacecraft. Beginning FY 2020, the EPS-R effort transferred from Program Element 1206434F, Midterm Polar MILSATCOM System to Program Element 1206432F, Polar MILSATCOM (SPACE), and in FY 2021 the EPS-R effort was transferred to Program Element 1206432SF. In FY 2022, EPS-R continues to develop and acquire two Extremely High Frequency (EHF) payloads hosted on Space Norway-procured spacecraft and continues to upgrade/modify the existing EPS Ground Control and Gateway.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Polar MILSATCOM weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

Funding in this exhibit was previously budgeted in PE 0605432F, Polar MILSATCOM (SPACE), and PE 1206434F, Midterm Polar MILSATCOM System.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206432SF *I Polar MILSATCOM (SPACE)*

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	190.235	129.455	0.000	129.455
Current President's Budget	0.000	190.235	127.870	0.000	127.870
Total Adjustments	0.000	0.000	-1.585	0.000	-1.585
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-1.585	0.000	-1.585

Change Summary Explanation

FY 2022: -$1.585M for inflation adjustment.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Segment	-	105.878	68.713
Description: Develop and acquire two EHF payloads, using AEHF's XDR waveform, for integration on host spacecraft. ***FY 2021 Plans:*** Continue development, fabrication, and testing of the two EPS-R payloads that were initiated in FY 2018. Ship one of two payloads to space vehicle (SV) vendor for integration onto the SV. Continue developing interface documentation and integration plans with international partner. Fund FY 2021 Department of the Air Force (DAF) share of Arctic Memorandum of Agreement (MOA) collaboration costs for hosting of the EPS-R payloads. Facilitate coordination between Space Norway, space vehicle vendor, and payload contractor. Provide representation, technical expertise, and assistance as necessary at Space Norway and/or space vehicle vendor facilities to support activities including payload integration and testing. Continue cyber certification efforts to include crypto procurement activities. Support development and integration for the EPS-R system strategic requirements. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:***			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206432SF *I Polar MILSATCOM (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue development, fabrication, and testing of the second EPS-R payload that was initiated in FY 2018. Ship second payload to SV vendor for integration onto the SV. Finalize interface documentation and integration plans with international partner. Fund FY 2022 DAF share of Arctic MOA collaboration costs for hosting of the EPS-R payloads. Facilitate coordination between Space Norway, space vehicle vendor, and payload contractor. Provide representation, technical expertise, and assistance as necessary at Space Norway and/or space vehicle vendor facilities to support activities including payload integration and testing. Support segment and system level testing. Continue cyber certification efforts. Support development and integration for the EPS-R system strategic requirements. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021. Focus shifts from development, fabrication, and testing of the payloads themselves to delivery, integration, and test of the payloads with the SV.			
Title: Ground Updates	-	50.399	44.993
Description: Modify and upgrade the existing EPS Control and Planning Segment (CAPS) to provide command and control and XDR mission planning capability for the two new payloads. ***FY 2021 Plans:*** Continue risk reduction efforts on and upgrade CAPS. Conduct Software Item Qualification Test (SIQT) for EPS-R CAPS Software (SW) items. Deliver Factory Acceptance Test (FAT) SW build. Conduct integration testing demonstrating interoperability of EPS-R CAPS with space vehicle, Host ground, and EPS-R payload. Accomplish link functionality testing between EPS-R CAPS and Space Norway Space Operations Center (SOC) location. Support development and integration for the EPS-R system strategic requirements. ***FY 2022 Plans:*** Continue CAPS upgrade to support EPS-R and EPS legacy. Deliver SIQT SW build, and develop/deliver additional SW builds as appropriate. Complete all in-band and out-of-band SOC hardware integration. Conduct Functional Configuration Audit and On-Orbit Activation Rehearsal. Support segment and system level testing, to include regression testing with EPS legacy payloads. Acquire Defense Information Systems Network (DISN) lines and associated equipment at various EPS-R and DISA ground nodes as appropriate to support Space Norway SOC out-of-band connectivity to the EPS-R payload as well as in-band connectivity between the various EPS-R ground nodes. Continue development, upgrades, and integration for the EPS-R system strategic requirements. Additionally, FY 2022 funding will allow the program to respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:***			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206432SF *I Polar MILSATCOM (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2022 decreased compared to FY 2021. As SW development continues to mature focus begins to shift towards segment and system testing and integration with the SOC.			
Title: Gateway Updates ***Description:*** Modify and upgrade the existing EPS Gateway to support the two new payloads. ***FY 2021 Plans:*** Execute risk reduction efforts, EPS Gateway upgrades, and system integration testing. Continue installation efforts for a second telemetry and control terminal. Upgrade additional telemetry and control terminals, including FAB-Ts, as necessary to support EPS-R. Support development and integration for the EPS-R system strategic requirements including any required terminal modifications. ***FY 2022 Plans:*** Continue EPS Gateway upgrades, and segment and system integration testing. Finish installation efforts and testing for a second telemetry and control terminal as well as a fourth Navy Multiband Terminal to support dual EPS/EPS-R operations to the extent EPS legacy remains operational. Upgrade additional telemetry and control terminals as necessary to support EPS-R. Support risk reduction/development, upgrades, and integration for the EPS-R system strategic requirements including required FAB-T software modifications. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021. As Gateway development continues to mature focus begins to shift towards segment and system integration and test.	-	33.958	14.164
Accomplishments/Planned Programs Subtotals	-	190.235	127.870

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

Awarded payloads contract to Northrop Grumman Aerospace Systems (NGAS) and initiated fabrication of two EPS functional equivalent payloads in FY 2018 (PE 1206434F). In FY 2019, the USAF and Norwegian Ministry of Defence signed the Arctic Memorandum of Agreement, which enforces the international collaboration with Norway to host the two EPS-Recapitalization (EPS-R) payloads on the Space Norway-procured spacecraft. Conducted market research to identify industry capabilities and acquisition concepts. Awarded CAPS contract for EPS ground upgrade. Gateway updates will be accomplished by Naval Information Warfare Center Pacific, the EPS Gateway Segment developer. The program office initiates the procurement of a replacement terminal for the Telemetry and Command Terminal. This acquisition strategy updates the EPS Ground Segment to accommodate the EPS functional equivalent payloads and extend operations and sustainment beyond 2028. The U.S.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206432SF *I Polar MILSATCOM (SPACE)*

Government will retain the system integrator role, as it was for EPS program of record.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206432SF / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 654215 / *EPS Recap*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
EPS-R Tactical Payloads 1-2	SS/CPIF	NGAS : Redondo Beach, CA	0.000	-		88.698	Nov 2020	56.089	Nov 2021	-		56.089	-	-	414.329
Control and Planning Segment Upgrades	SS/CPIF	NGMS : Redondo Beach, CA	0.000	-		42.221	Nov 2020	36.780	Nov 2021	-		36.780	-	-	86.930
Gateway Upgrades	Various	Various : Various, CA	0.000	-		28.448	Nov 2020	11.578	Nov 2021	-		11.578	-	-	68.895
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	0.000	-		6.000	Nov 2020	6.000	Nov 2021	-		6.000	-	-	-
Enterprise SE&I	C/CPAF	LinQuest : Los Angeles, CA	0.000	-		19.063	Nov 2020	13.857	Nov 2021	-		13.857	-	-	-
		Subtotal	0.000	-		184.430		124.304		-		124.304	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	MIPR	Aerospace : El Segundo, CA	0.000	-		0.850	Oct 2020	0.850	Oct 2021	-		0.850	-	-	-
A&AS	Various	Various : Various	0.000	-		4.805	Oct 2020	2.566	Oct 2021	-		2.566	-	-	-
Other Support	Various	Various : Various	0.000	-		0.150	Oct 2020	0.150	Oct 2021	-		0.150	-	-	-
		Subtotal	0.000	-		5.805		3.566		-		3.566	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		190.235		127.870		-		127.870	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206432SF / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 654215 / *EPS Recap*

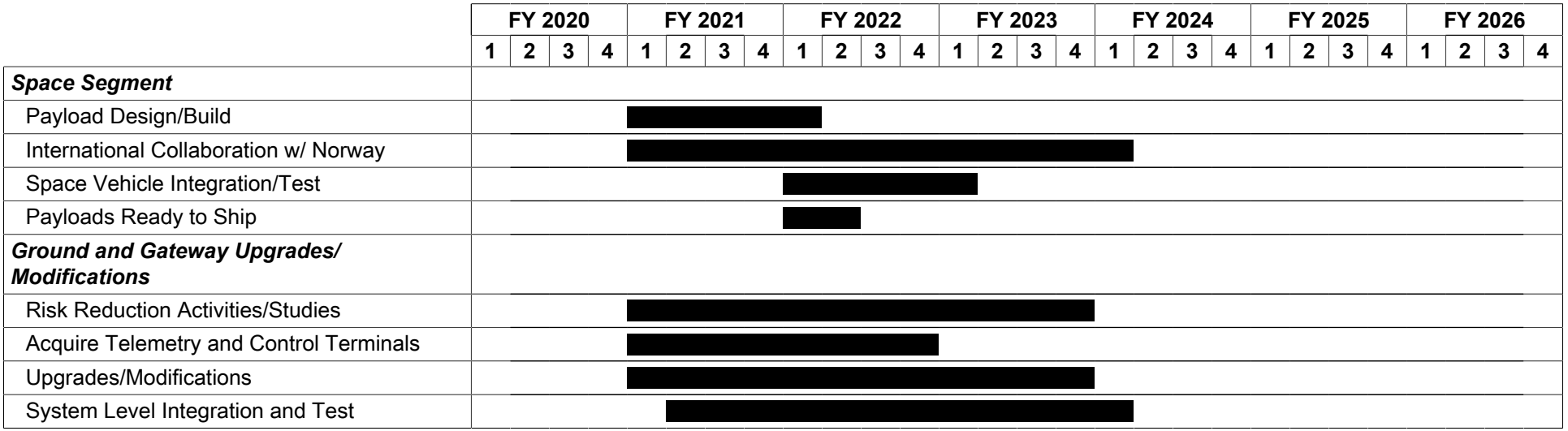

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206432SF / *Polar MILSATCOM (SPACE)*	**Project (Number/Name)** 654215 / *EPS Recap*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Space Segment				
Payload Design/Build	1	2021	1	2022
International Collaboration w/ Norway	1	2021	1	2024
Space Vehicle Integration/Test	1	2022	1	2023
Payloads Ready to Ship	1	2022	2	2022
Ground and Gateway Upgrades/Modifications				
Risk Reduction Activities/Studies	1	2021	4	2023
Acquire Telemetry and Control Terminals	1	2021	4	2022
Upgrades/Modifications	1	2021	4	2023
System Level Integration and Test	2	2021	1	2024

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206442SF *I Next Generation OPIR*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	2,318.864	2,451.256	0.000	2,451.256	-	-	-	-	-	-
657009: *Space Mod Initiative*	-	0.000	209.662	110.313	0.000	110.313	-	-	-	-	-	-
657106: *Next-Gen OPIR Ground*	-	0.000	498.289	514.577	0.000	514.577	-	-	-	-	-	-
657120: *Next-Gen OPIR Space, Block 0 GEO*	-	0.000	1,128.900	1,137.393	0.000	1,137.393	-	-	-	-	-	-
657121: *Next-Gen OPIR Space, Block 0 Polar*	-	0.000	482.013	661.098	0.000	661.098	-	-	-	-	-	-
657123: *Integration*	-	0.000	0.000	27.875	0.000	27.875	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Next Generation Overhead Persistent Infrared (Next-Gen OPIR) program will succeed the current Space Based Infrared System (SBIRS) and will provide improved missile warning, missile defense, battlespace awareness, and technical intelligence collection capabilities that are more survivable against emerging adversary threats. The program will deliver satellites in geosynchronous and highly elliptical orbits in two Blocks (Block 0 and Block 1); a modular, extensible, and cyber-hardened ground system to operate and process mission data downlinked from on-orbit assets; an on-ramp to demonstrate novel infrared technologies; and an integration effort will identify, plan, manage and execute integration activities at the enterprise level. The program is comprised of six projects, summarized below:

1. Next-Gen OPIR Space Modernization Initiative (SMI) (Project 657009): To better enable response to emerging global missile threats, SMI advances capabilities and reduces risk through three major thrust areas: Demonstrations, Technology Maturation, and Data Exploitation. Demonstrations mature technologies by delivering ground and on-orbit prototypes. Demonstrations advance OPIR capabilities for missile warning and tracking ensuring a low risk, smooth transition of advanced technology to future operational systems. Technology Maturation focuses investments on high pay-off critical components to reduce production risks and development costs. Technology Maturation focuses development on advanced IR sensing optics and electronics; resiliency hardware and software; and on-board processing algorithms and on-board computers. Data Exploitation enables access to OPIR data sources to expand technical intelligence and battlespace awareness processing and data dissemination tools to support warfighters and other data users. SMI supports Next-Gen OPIR by maturing new technologies to enable detection of new and challenging missile threats. SMI funds engineering activities to reduce both production and future system costs through manufacturing and producibility enhancements, and technology insertion. SMI generally includes studies and risk reduction activities to evolve the current Program of Record (PoR) constellation and/or simultaneously mature breakthrough technologies to create a leap in capability for follow-on systems.

2. Next-Gen OPIR Ground (Project 657106): Next-Gen OPIR Ground, also known as Future Operationally Resilient Ground Evolution (FORGE), consists of Command and Control (C2) migration to the Space Force's Enterprise Ground Services (EGS), modernization of Mission Data Processing (MDP) to implement an open framework, and required development and/or upgrades to Relay Ground Stations (RGS) to meet United States Space Command guidance on the current and future space domain demands. FORGE and EGS efforts combined will provide the flexibility and scalability to integrate new satellites, sensors, and capabilities more rapidly and efficiently in order to meet evolving threats and warfighter needs. The Next-Gen OPIR ground efforts enable cyber enhancements for both space and ground systems. EGS

will introduce common ground services such as Telemetry, Tracking, and Commanding (TT&C); mission management; and automation. To support initial Next-Gen OPIR Space satellite launches without driving risks into the FORGE development schedule, the program will establish a risk reduction ground Next-Gen OPIR Interim Operations (NIO) capability based on a limited Space Based Infrared System (SBIRS) Block 20 solution that can be utilized if FORGE is delayed.

3. Next-Gen OPIR Space, Block 0 GEO (NGG) (Project 657120): Joint Requirements Oversight Council Memorandum (JROCM) 130-17, dated 21 December 2017, directs the development of the next generation of strategically survivable space-based missile warning OPIR platforms in both GEO and Polar orbits. The Program Office is acquiring the NGG capability in two contract actions. Phase 1, awarded in August 2018, encompasses requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR). Phase 2 was awarded in FY 2021 for the manufacturing, assembly, system integration and test, launch, and early on-orbit test, through operational acceptance of NGG satellites 1-3. The first GEO satellite is required no later than FY 2025.

4. Next-Gen OPIR Space, Block 0 Polar (NGP) (Project 657121): The Program Office is acquiring the NGP capability through three contract phases. Phase 0, awarded in June 2018, encompassed system requirements analysis and risk reduction efforts, which led to a March 2020 System Requirements Review (SRR). Phase 1, awarded May 2020, encompasses design and development, critical path flight hardware procurement, and risk reduction efforts leading to a System CDR. Phase 2 will be awarded in FY 2024 prior to System CDR for the manufacturing, assembly, integration and test, and early on orbit test, through operational acceptance of NGP satellites 1 and 2. The first Polar satellite is required in FY 2028.

5. Next-Gen OPIR Space, Block 1 (Project 657122): The Space Force plans to acquire subsequent blocks in a competitive environment. The Block 1 satellites will be based on the Missile Warning and Missile Defense OPIR Capability Development Document (CDD), validated by the Joint Requirements Oversight Council (JROC) in May 2019. The Next Gen OPIR Block 1 program acquisition will begin in FY 2024 in time to deliver its first satellite by FY 2031.

6. Integration (Project 657123): The Next Generation OPIR Integration project includes the direct Enterprise Systems Engineering and Integration (SE&I) efforts associated with the Government's primary role in, and tasks necessary to accomplish, the critical lead system integration function with the Next Gen OPIR enterprise material segments (Next Gen GEO, Next Gen Polar and Next Gen Ground). The focus of the Integration project is on system-level integration requirements between segments such as Space to Ground. This differs from integration within each segment which refers to subsystem-level integration between subsystems such as a spacecraft bus to the mission payload. The Government Integrator directs the Next Gen OPIR current enterprise architecture and system definition, controls and validates interfaces, ensures compatibility of Next Gen systems, and develops/manages plans for execution and fielding of the Next Gen OPIR Enterprise. Further, the Integrator executes unique Model Based System Engineering and integration requirements of each segment through provision of modeling, simulation, and technical analyses of Government-directed enterprise level trades among the Next Gen OPIR segments. These trades lead to definition, management, maintenance, and evolution of the Next Gen OPIR Enterprise requirements and interface technical documents to ensure the integrity of the enterprise technical baseline. Beginning in FY 2022, Next Generation OPIR Integration became a stand-alone project to emphasize the criticality of the lead system integration function and provide transparency that the function is being appropriately managed and resourced. Next Generation OPIR Integration was previously executed and funded within the Next Gen OPIR Ground (Project 657106), Next Gen Block 0 GEO (Project 657120), and Next Gen OPIR Block 0 Polar (Project 657121) projects, so it is not a new start.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206442SF *I Next Generation OPIR*

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Next-Gen OPIR weapon system capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206389SF.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because the majority of Projects under PE 1206442SF have been declared Section 804 Rapid Prototype efforts conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	2,318.864	2,319.702	0.000	2,319.702
Current President's Budget	0.000	2,318.864	2,451.256	0.000	2,451.256
Total Adjustments	0.000	0.000	131.554	0.000	131.554
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	131.554	0.000	131.554

Change Summary Explanation

FY 2022: +131.554M; reflects net of +161.950M for NG OPIR project changes and -30.396M for inflation adjustments. NG OPIR project changes include the following: +251.0M for NG Polar; -88.0M from Space Modernization Initiative (SMI) Medium Earth Orbit (MEO) missile tracking demonstration; -1.0M from Integrated Broadcast Service (IBS) Modernization.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / *Next Generation OPIR*	Project (Number/Name) 657009 / *Space Mod Initiative*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
657009: *Space Mod Initiative*	-	0.000	209.662	110.313	0.000	110.313	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Next-Gen OPIR Space Modernization Initiative (SMI) (Project 657009): To better enable response to emerging global missile threat, SMI advances capabilities and reduces risk through three major thrust areas: Demonstrations, Technology Maturation, and Data Exploitation. Demonstrations mature technologies by delivering ground and on-orbit prototypes. Demonstrations advance OPIR capabilities for missile warning and tracking ensuring a low risk, smooth transition of advanced technology to future operational systems. Technology Maturation focuses investments on high pay-off critical components to reduce production risks and development costs. Technology Maturation focuses development on advanced IR sensing optics and electronics; resiliency hardware and software; and on-board processing algorithms and on-board computers. Data Exploitation enables access to OPIR data sources to expand technical intelligence and battlespace awareness processing and data dissemination tools to support warfighters and other data users. SMI supports Next-Gen OPIR by maturing new technologies to enable detection of new and challenging missile threats. SMI funds engineering activities to reduce both production and future system costs through manufacturing and producibility enhancements, and technology insertion. SMI includes studies and risk reduction activities to evolve the current Program of Record (PoR) constellation and simultaneously mature breakthrough technologies to create a leap in capability for follow-on systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Demonstrations	-	95.520	10.751
Description: Demonstrations mature and prove viability of OPIR technologies, missions, and performance with ground and on-orbit prototypes. Demonstrations enable transition of improved capabilities to full scale architectures and inform critical decisions for future fielding. Additionally, demonstrations support maturation of Mission Data Processing (MDP) algorithms for tactical and strategic applications by providing additional sensors and algorithms to advance detection and tracking. The Wide Field Of View (WFOV) demonstration matures WFOV technology and validates multi-mission capabilities including the potential for a single sensor to simultaneously perform strategic and tactical missions. WFOV is ready for launch in FY 2021. Collection of on-orbit WFOV data is critical to develop algorithms to process large data set generated by emerging large format focal planes and reduce risk for future architectures. The WFOV payload and bus are separate development efforts. The WFOV testbed program provides a bus capable of demonstrating on-orbit mission performance and mitigating the development risks for employing WFOV sensors. The testbed program will integrate, test, and launch a prototype WFOV payload with a government-owned free flyer spacecraft. The WFOV testbed will host the WFOV payload. As an integrated Space Vehicle, the WFOV system will prove on-orbit mission performance of WFOV sensors. The WFOV payload will provide the critical on-orbit data required to develop and validate WFOV algorithms, as well as on-board MDP throughput requirements for strategic missile warning.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657009 / *Space Mod Initiative*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The Missile Track Custody Digital Engineering Risk Reduction effort (previously named Block 1 Prototype) is a demonstration that will track emerging missile threats outlined in the Missile Warning (MW) Missile Defense (MD) Capability Development Document (CDD). The Missile Track Custody Digital Engineering Risk Reduction effort will fill noted knowledge gaps identified by the Integrated OPIR Missile Warning & Missile Defense Interagency Team by developing digital models and engineering development units. This effort assesses the feasibility of missile tracking from MEO with ground based hardware in-the-loop simulations. The Missile Track Custody Digital Engineering Risk Reduction effort, combined with Space Development Agency and Missile Defense Agency (MDA) OPIR system data, are critical to informing the ongoing Analysis of Alternatives for the future combined missile warning and defense architecture. The primary mission of this digital engineering effort is to provide data on the feasibility of track custody data for post boost tracking and track to burn-out of dim upper stage missiles. The effort will carry up to two mission payload vendor designs through critical design review by the end of FY 2022. The effort will deliver CDR level designs and digital models to the USSF and OSD for detailed architecture analysis. Based on success of WFOV and the Missile Track Custody Digital Engineering Risk Reduction effort, the Space Force will determine key technologies necessary to demonstrate to support the future architecture. Prototype work is planned once the Analysis of Alternatives is complete and the DoD has reached a decision on future architecture needs. ***FY 2021 Plans:*** WFOV Demonstration: Finalize launch service integration campaign. Demo ready for launch in FY 2021. Complete WFOV OCONUS ground infrastructure bed-down. Complete Blossom Point Tracking Facility integration to support Command and Control (C2) and data dissemination. Finalize on-orbit mission calibration planning and execution. Continue support of WFOV Space Vehicle maintenance and storage. Complete any remaining integrated WFOV Space Vehicle end-to-end test and maintenance. Continue Systems Engineering, Integration and Test (SEIT) activities including pre-launch preparations, mission operations planning, and training. Conduct on-orbit checkout operations and initiate execution of the experimentation plan. Missile Track Custody Digital Engineering Risk Reduction: Execute option for up to two contractors that culminates in a tailored delta Preliminary Design Review (PDR) progressing to a Space Vehicle PDR in FY 2022. Continue to mature ground integration plan. Begin development of engineering model for a resiliency ground demonstration sensor test bed. Continue procuring long lead items. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** WFOV Demonstrations: Continue to mature ground integration plan to ensure ground mission data processing and Space Vehicle Command and Control after launch. Continue development of launch and early orbit test plan to ensure Space Vehicle deployment and mission payload calibration. Refine experimentation plan to verify prototype meets requirements; and finalize transition to operations plan.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657009 / *Space Mod Initiative*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Missile Track Custody Digital Engineering Risk Reduction: Execute Other Transaction Agreement for up to two contractors that culminates in a Mission Payload Critical Design Review (CDR) by end of FY 2022. Continue to develop digital engineering tools to model sensor performance across a variety of orbits and inform future OPIR architecture studies. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased to be consistent with Chief of Space Operations programmatic guidance.			
Title: Technology Maturation	-	44.719	38.492
Description: Assess technology needs to support resiliency of PoR assets and future architectures that are responsive to the evolving threat environment. Perform trade and design studies to assess obsolescence, affordability, capability design modifications, and CONOPS for the OPIR mission. Mature technologies and manufacturability to reduce cost, schedule, and technical risk for new component and subsystem designs that may be used in the future systems. Mature technologies including algorithms, Focal Plane Arrays (FPA), optical filters, on-board processors, auxiliary resiliency payloads, and other payload components for future missile warning satellites, and reconstitution capabilities. Develop modeling and simulation (M&S) capabilities, and engineering model prototypes for hardware/software integration and testing. These efforts will reduce risk and mature technologies applicable to future systems and architectures. Additionally, develop test beds to validate/verify requirements and ensure technical maturity for next-generation payload technologies as well as threat mitigation components and techniques. ***FY 2021 Plans:*** Initiate development of critical technologies that directly impact the performance of current technology efforts (Back-end electronics, cryocoolers, etc). Continue prototyping resilient hardware and maturing critical technologies that include large format FPAs, resilient FPAs, resilient processing algorithms, pointing mirrors, threat sensors, and processors for earliest integration into Next Gen OPIR or similar programs. Continue to develop technology options to address emerging threats and stressing targets to current and future OPIR systems. Continue to develop and space qualify emerging technologies to reduce risk for Next Gen OPIR satellites. Continue to develop system resiliency and advanced technology concepts via Hardware-in-the-Loop (HWIL) modeling and simulations in order to demonstrate performance, develop CONOPS, and prove enhanced system capabilities. Continue the integration of sensor test bed components and conduct resiliency characterization tests in the sensor ground test bed. Continue to develop on-board algorithms that support processing of large format arrays. Continue to enhance system response to emerging threats and stressing targets. Begin maturation of sensor and bus modularity concepts. ***FY 2022 Plans:*** Ongoing technology maturation efforts will deliver initial flight grade FPAs in early FY 2022. Accelerate data-processing technologies, including resilient algorithms, delivering standard scenes, and studies to investigate minimum detectable targets and raid scenarios. Begin maturing additional new technologies in support of emerging program of record needs, including resilient FPAs, radiation hardened memory, and reduced cost cryo-coolers. Continue prototyping resilient hardware and			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657009 / *Space Mod Initiative*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
maturing critical technologies that include large format FPAs, resilient FPAs, resilient processing algorithms, pointing mirrors, threat sensors, and processors for earliest integration into Next-Gen OPIR or similar programs. Continue to develop technology options to address emerging threats and stressing targets to current and future OPIR systems. Continue to develop and space qualify emerging technologies to reduce risk for Next-Gen OPIR satellites. Continue to develop system resiliency and advanced technology concepts via ground and on-orbit demonstrations to validate performance, develop CONOPS, and prove enhanced system capabilities. Continue to develop test bed components for resiliency, requirements verification/validation, and to enhance technology maturation. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased to be consistent with Chief of Space Operations programmatic guidance.			
Title: Data Exploitation ***Description:*** Data exploitation efforts will exploit existing OPIR data sources including Defense Support Program (DSP), SBIRS Highly Elliptical Orbit (HEO), SBIRS GEO Scanner, SBIRS GEO Starer, prototypes, and other sources. Efforts will exploit data through collection, processing, fusion, data dissemination, algorithm development and testing, network connectivity, and sensor performance assessments. SBIRS and other sensors provide a rich data set for exploitation. SMI data exploitation enables access to raw and processed data for data analysts and application developers to expand capabilities for battlespace awareness and other applications. SMI data exploitation efforts are complementary to, and enhance, the exploitation capabilities delivered by the PoR and prototypes. SMI will develop tools and algorithms to enable users to apply OPIR data to support their mission needs. Data exploitation efforts also evaluate tools for C2, mission management, and MDP to reduce risk. Data exploitation efforts evolve the PoR ground system to an open architecture that could support PoR and other future satellite alternatives. SMI ground system development activities seek to demonstrate the performance of an evolved ground system architecture capable of supporting multiple satellites, payloads, and missions through management and data processing. These efforts seek to lower operating costs with enhanced net-centric and service-oriented features with a new flexible expansion capability. Data exploitation efforts support demonstration and prototype architecture planning and experimentation. ***FY 2021 Plans:*** Begin operations of data exploitation lab capability. Support experimentation, technology maturity, and evolution of exploitation algorithms. Continue to provide enhanced ground segment capability and tools for C2, data collection, mission processing, and data dissemination. Enhance mission resiliency and data exploitation of SBIRS and other OPIR data. Continue to collaborate with Intelligence Community (IC) and MDA to enhance Joint OPIR Ground (JOG) study initiatives. Continue development of applications for data exploitation of Infrared (IR) data within the data exploitation lab. Continue development and expansion of a Battlespace Awareness real-time capability in the OPIR Battlespace Awareness Center (OBAC) that will integrate applications and services matured in the data exploitation government lab. Continue to develop, expand, and manage the common open	-	69.423	61.070

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657009 / *Space Mod Initiative*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
framework architecture of the data exploitation lab and real-time OBAC capability. Support development of experimental operations and additional uses of the program of record data in the OBAC. Develop prototype processes for managing an open framework architecture. Develop applications for the OBAC that transition to the Future Operationally Resilient Ground Evolution (FORGE). Develop and demonstrate the performance of a Government owned open and extensible evolved ground system architecture to support multiple satellites, payloads, and missions. Demonstrate data processing for any infrared payload with enhanced net-centric and service-oriented features with a flexible expansion capability. Incorporate results from WFOV payload calibration into WFOV MDP software. Develop and test WFOV calibration algorithm and execute the WFOV on-orbit calibration. Support demonstration and prototype architecture planning and experimentation. ***FY 2022 Plans:*** Innovate wildland fire tracking capabilities and incorporate applications into national fire tracking solution. Begin Data Exploitation efforts on Wide Field of View (WFOV) system as the satellite transitions from on-orbit check-out to its detailed experimentation plan. Incorporate results from WFOV payload calibration into WFOV MDP software. Develop and test WFOV calibration algorithm and execute the WFOV on-orbit calibration. Continue expanding operational capability of the data exploitation lab enabling applications to advance from a prototype state to a near-fully operational capability. Complete expansion of a Battlespace Awareness real-time capability in the OPIR Battlespace Awareness Center (OBAC) that will integrate applications and services matured in the data exploitation government lab. Continue to develop, expand, and manage the common open framework architecture of the data exploitation lab and real-time OBAC capability. Support development of experimental operations and additional uses of the program of record data in the OBAC. Develop prototype processes for managing an open framework architecture. Develop applications for the OBAC that transition to the Future Operationally Resilient Ground Evolution (FORGE). Support experimentation, technology maturity, and evolution of exploitation algorithms and continue to provide enhanced ground segment capability and tools for C2, data collection, mission processing, and data dissemination via the Space Enterprise Consortium contract vehicle. Enhance mission resiliency and data exploitation of SBIRS and other OPIR data. Continue to collaborate with the Intelligence Community (IC) and Missile Defense Agency (MDA) to enhance Joint OPIR Ground (JOG) study initiatives. Develop and demonstrate the performance of a Government owned open and extensible evolved ground system architecture to support multiple satellites, payloads, and missions. Demonstrate data processing for any infrared payload with enhanced net-centric and service-oriented features with a flexible expansion capability. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased to be consistent with Chief of Space Operations programmatic guidance.			
Accomplishments/Planned Programs Subtotals	-	209.662	110.313

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657009 / *Space Mod Initiative*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPAF 01 MSSBIR: *SBIR High (Space)*	-	160.891	156.481	-	156.481	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

The program office will use a variety of acquisition approaches to execute various concept studies, technology maturation efforts, testbed/prototype demonstrations, and data exploitation initiatives and projects. The program office will collaborate with appropriate contracting agencies to support each individual effort. Data exploitation efforts in the laboratory and the OPIR Battlespace Awareness Center (OBAC) will leverage existing external contracts, as well as new internal competitive contracts. Activities, such as SBIRS obsolescence and affordability enhancements to the existing satellite design, will leverage existing Program of Record contracts. Technology maturation and component prototyping and/or qualification could leverage existing contracts. Broad Agency Announcements (BAAs) and Other Transaction Authorities are planned in collaboration with Air Force Research Lab (AFRL) and other government agencies. Where practical, other efforts are competed. An SMC BAA will be used to acquire and mature high priority technology items. Federally Funded Research and Development Center (FFRDC), University Affiliated Research Centers (UARCs), and Systems Engineering and Technical Assistance (SETA) contractors will also be used to conduct and support studies. New technology, replacement components, and system designs will be acquired with government data rights to the maximum extent, allowing incorporation into future OPIR satellite production or system development. Contracting partnerships with other agencies will also be used to study, develop, demonstrate, and prove emerging capabilities. Funding in execution years will be realigned within the Next-Gen OPIR program element to respond to execution requirements. To accelerate contracting actions and program execution, a local SMC contract vehicle will be utilized for the OPIR Battlespace Awareness Center (OBAC) and government lab services.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / *Next Generation OPIR*	Project (Number/Name) 657009 / *Space Mod Initiative*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Demonstrations	Various	Various : Various	-	-		86.201	Dec 2020	9.723	Dec 2021	-		9.723	-	-	-
Technology Maturation	Various	Various : Various	-	-		40.356	Jan 2021	28.735	Jan 2022	-		28.735	-	-	-
Data Exploitation	Various	Various : Various	-	-		62.651	Jan 2021	53.459	Jan 2022	-		53.459	-	-	-
Technical Mission Analysis	RO	Aerospace Corporation : El Segundo, CA	-	-		7.781	Oct 2020	8.012	Oct 2021	-		8.012	-	-	-
		Subtotal	-	-		196.989		99.929		-		99.929	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	Various	Various : Various	-	-		4.986	Dec 2020	5.520	Dec 2021	-		5.520	-	-	-
A&AS	Various	Various : Various	-	-		1.387	Oct 2020	2.214	Oct 2021	-		2.214	-	-	-
Other Support	Various	Various : Various	-	-		6.300	Jan 2021	2.650	Jan 2022	-		2.650	-	-	-
		Subtotal	-	-		12.673		10.384		-		10.384	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		209.662		110.313		-		110.313	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657009 / *Space Mod Initiative*

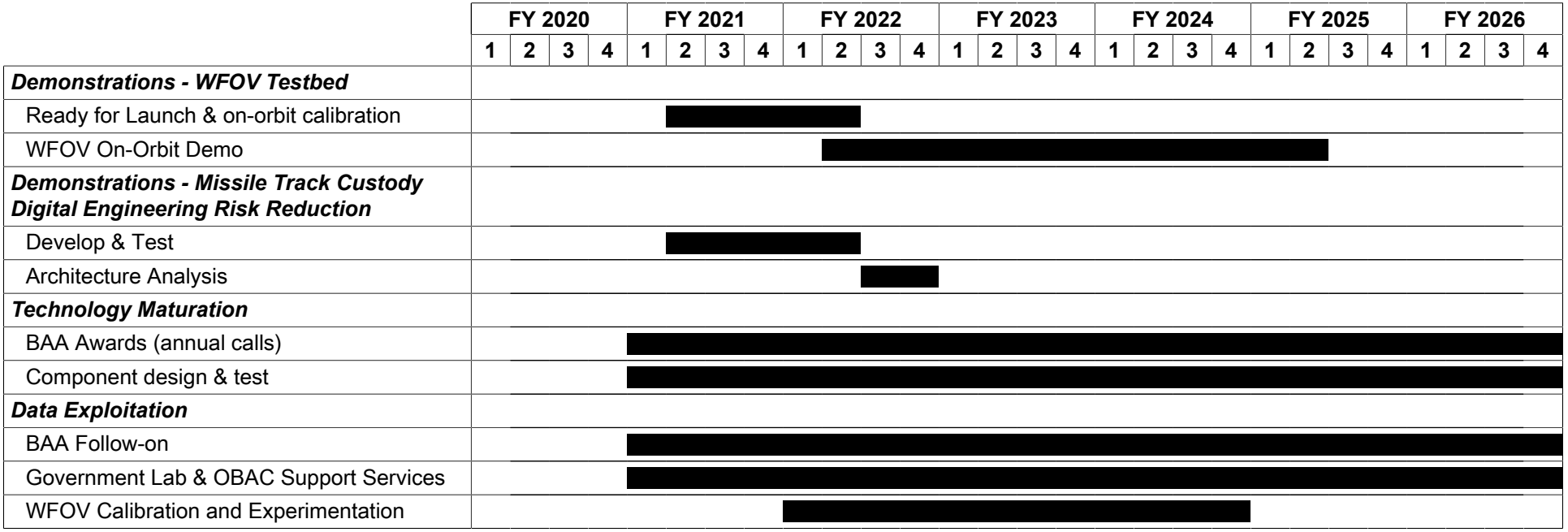

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657009 / *Space Mod Initiative*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Demonstrations - WFOV Testbed				
Ready for Launch & on-orbit calibration	2	2021	2	2022
WFOV On-Orbit Demo	2	2022	2	2025
Demonstrations - Missile Track Custody Digital Engineering Risk Reduction				
Develop & Test	2	2021	2	2022
Architecture Analysis	3	2022	4	2022
Technology Maturation				
BAA Awards (annual calls)	1	2021	4	2026
Component design & test	1	2021	4	2026
Data Exploitation				
BAA Follow-on	1	2021	4	2026
Government Lab & OBAC Support Services	1	2021	4	2026
WFOV Calibration and Experimentation	1	2022	4	2024

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / *Next Generation OPIR*	Project (Number/Name) 657106 / *Next-Gen OPIR Ground*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
657106: *Next-Gen OPIR Ground*	-	0.000	498.289	514.577	0.000	514.577	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Next-Gen OPIR Ground (Project 657106): Next-Gen OPIR Ground, also known as Future Operationally Resilient Ground Evolution (FORGE), consists of Command and Control (C2) migration to US Space Force (USSF) Enterprise Ground Services (EGS), modernization of Mission Data Processing (MDP) to implement an open framework and develop mission applications, and required development and/or upgrades to Relay Ground Stations (RGS) to meet USSF current and future space domain demands. FORGE and EGS efforts combined will provide the flexibility and scalability to integrate new satellites, sensors and capabilities more rapidly and efficiently in order to meet evolving threats and warfighter needs. The Next-Gen OPIR ground efforts enable cyber enhancements for both space and ground systems. EGS will introduce common ground services such as Telemetry, Tracking, and Commanding (TT&C); mission management; and automation. To support initial Next-Gen OPIR Space satellite launches without driving risk into the FORGE development schedule, the program has established a risk reduction ground Next-Gen OPIR Interim Operations (NIO) capability based on a limited Space Based Infrared System (SBIRS) Block 20 solution.

Starting in FY 2022, a portion of funding has been transferred from Projects 657120, 657121, and 657106, to Project 657123, Next Generation OPIR Enterprise Systems Integration to support end-to-end system integration across space, ground and data exchange segments. The focus of the Integration project is on system-level integration requirements between segments such as Space to Ground. This differs from integration within each segment; integration within segments refers to subsystem-level integration between subsystems such as a spacecraft bus to the mission payload.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: FORGE - EGS/C2	-	90.470	77.141
Description: The Space Force is transitioning to Enterprise Ground Services, a Government-owned ground architecture that focuses on Mission Management (MM), TT&C, and Ground Control (GC) utilizing common services. FORGE C2 creates Mission Unique Software (MUS) and provides sensor/spacecraft specific C2 capabilities to plug into the EGS suite of services. The legacy SBIRS constellation assets C2 will be transitioned using the FORGE C2 portion of EGS. ***FY 2021 Plans:*** GEO Non-Integrated Threat Warning/Attack Assessment (ITW/AA) Ops Migration to EGS (GNOME): Continue development of C2 MUS for a GEO space vehicle. Award lead integrator role and begin integration of MUS & core applications onto EGS. Naval Research Lab (NRL) will develop software required to operate MUS with core applications on the EGS framework (i.e., Neptune & Virtual Mission Operations Center (VMOC)).			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657106 / *Next-Gen OPIR Ground*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
SBIRS Constellation Cutover (C2X): Develop MUS, Sensor Specific Processing (SSP) and integration activities to support migration of all HEOs and GEO assets to EGS/FORGE framework. Develop or refine NRL software required to operate core applications, and conduct preliminary testing. EGS Cost Share: Accounts for program office cost share to EGS development and support for the GNOME, C2X, and Next-Gen GEO programs. ***FY 2022 Plans:*** GNOME: Continue development and integration of C2 MUS and core applications for a GEO space vehicle onto EGS. Conduct live testing of developed MUS and integrated system at all applicable test locations. Work with NRL to refine software required to operate MUS with core applications on the EGS framework (i.e., Neptune & VMOC) and support deficiency burn-down from test events. C2X: Continue development of MUS, SSP and integration activities to support migration of all HEOs and GEO assets to EGS/ FORGE framework. Continue to develop or refine NRL software required to operate core applications, and conduct preliminary testing. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to completion of EGS Cost Share requirement.			
Title: FORGE - Mission Data Processing (MDP) ***Description:*** The FORGE MDP effort creates a replacement for the existing legacy SBIRS Ground mission processing applications which have cyber security and scalability limitations. MDP is creating a cyber-resilient, flexible, and scalable open framework capable of meeting current and future threats. MDP will plan OPIR and other mission data resource utilization to meet warfighter requirements. MDP provides the ability to ingest and publish varying levels of processed data for enhanced processing, perform efficient and systematic upgrades, and orchestrate real-time wide-band processing for ITW/AA and non-ITW/AA mission areas. The MDP system provides modular mission applications to meet the future challenges of Missile Warning (MW), Missile Defense (MD), Battlespace Awareness (BA), Technical Intelligence (TI). MDP is critical to making cyber-secure, effective use of the increased amounts of data that will be collected by Next-Gen OPIR. ***FY 2021 Plans:*** Continue development of MDP system framework and initial applications. Establish MDP capability in contractor facilities and Government laboratory environment. Continue development of SBIRS Legacy and Next Gen Polar sensor specific processing software. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:***	-	234.515	265.751

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657106 / *Next-Gen OPIR Ground*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue development of MDP system follow-on framework. Award follow-on Mission Data Processing Applications Provider (MDPAP) effort. Establish MDP capability in the OPIR Battlespace Awareness Center (OBAC) and backup Mission Control Station (MCS) enclaves. Begin creating and processing approved plans for ITW/AA, Theater Event System, and Missile Defense certification. Continue development of SBIRS Legacy and Next Gen Polar sensor specific processing software. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to multiple efforts of new capability development and follow-on support for MDPAP.			
Title: Next Gen Interim Operations (NIO) ***Description:*** The NIO effort is a risk reduction effort for FORGE. It is being developed simultaneously with the full Next-Gen OPIR Ground efforts to ensure the most critical ground processing is ready in time for the first Next-Gen OPIR satellite launch. It will provide the ability to perform limited processing of the data from the NGG asset using the FORGE Mission Data Processing and C2 solutions. NIO follows a similar paradigm utilized for processing the initial HEO and GEO assets where HEO Mono Tracks (HMTs) and GEO Mono Tracks (GMTs) were fused outside of the operational baseline. The NIO solution will create mono tracks and publish those mono tracks to the existing SBIRS Block 20 ground system for fusion and dissemination to the warfighter. ***FY 2021 Plans:*** Complete the Critical Design Review and begin to develop the risk reduction system. Scale the scope of the risk reduction development based on evolving technology maturity level of the FORGE C2/MDP solutions. Continue to execute Next Gen GEO (NGG) Phase 1 and initiate NGG Phase 2 contract which will have large hardware purchases for lab build out. ***FY 2022 Plans:*** Continue development of the risk reduction system, and conduct early integration and testing events. Continue development of FORGE C2 and start integration with EGS. Start install of hardware at the Consolidated and Continental United States (CONUS) Relay ground sites. Start integration of mission data processing applications into the framework to support NGG Phase 1. Continue to execute NGG Phase 2 contract. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to completion of initial mission data processing applications to support NGG Phase 1.	-	131.328	128.685
Title: FORGE - Relay Ground Stations (RGSs)	-	41.976	43.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657106 / *Next-Gen OPIR Ground*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: OPIR data collected in space must be relayed to ground entry points and routed to provide warfighters with timely information. The legacy SBIRS ground architecture requires RGS upgrades and new RGSs to receive OPIR data from legacy and future Next-Gen OPIR assets. This effort expands the set of RGSs with up to three additional RGSs that will use common hardware capable of supporting both GEO and Polar assets. This effort will provide data to the MCS for processing and dissemination to warfighters and National Command Authorities. The RGS modernization effort will include the ability to operate antennas, process data, and support older Defense Support Program (DSP) assets. ***FY 2021 Plans:*** Relay Ground Station (RGS): Continue build-out of the RGS-Asia (RGS-A) facility which is an integral part of RGS development and prepare for installation/checkout of modernized capabilities. ***FY 2022 Plans:*** Relay Ground Station (RGS): Continue build-out of RGS-A site facility which is an integral part of RGS Development. Continue antenna/infrastructure installation and prepare for check out. Perform site surveys and planning for the next RGS site. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to continuing effort to install, integrate and test first site while initiating planning and design efforts on the second site.			
Accomplishments/Planned Programs Subtotals	-	498.289	514.577

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Next Gen OPIR Ground program is executing an acquisition strategy using Middle Tier of Acquisition (MTA) authority for Rapid Prototyping approved via Acquisition Decision Memorandum on 5 Dec 19.

To support this acquisition strategy, the program will follow an agile approach to develop capabilities and a robust DevSecOps (Development/Security/Operations) solution to deliver the capabilities. The FORGE program is pursuing a rapid prototyping approach founded primarily on software and infrastructure reuse, partnerships with other programs, limited scope, use of existing contracts where necessary, and maximizing competition where possible. For the MDP thrust, the FORGE program will competitively use Other Transaction (OT) authorities to develop the framework and the applications. For the C2 thrust, the program team will use existing SMC contracts with an emphasis to on-ramp to Enterprise Ground Services as soon as practical. For the NIO effort, the program is using the Next Gen GEO contract with the prime contractor. The program is executing the MDP, C2, and NIO thrusts within the scope of its Middle Tier of Acquisition authorities. The program is executing the RGS thrust using traditional acquisition authorities.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / *Next Generation OPIR*	Project (Number/Name) 657106 / *Next-Gen OPIR Ground*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FORGE - EGS/C2	Various	Various : Various	-	-		90.470	Nov 2020	77.141	Jan 2022	-		77.141	-	-	-
FORGE - MDP	Various	Various : Various	-	-		183.664	Nov 2020	211.837	Nov 2021	-		211.837	-	-	-
FORGE - NIO (Risk Reduction Option)	Various	Various : Various	-	-		131.328	Nov 2020	128.684	Nov 2021	-		128.684	-	-	-
FORGE - RGS	Various	Various : Various	-	-		41.976	Nov 2020	43.000	Nov 2021	-		43.000	-	-	-
Enterprise SE&I	C/CPAF	Engility Corp : Andover/ MA	-	-		18.941	Nov 2020	18.992	Dec 2021	-		18.992	-	-	-
Technical Mission Analysis	RO	Aerospace Corporation : El Segundo/ CA	-	-		2.130	Nov 2020	2.125	Jan 2022	-		2.125	-	-	-
		Subtotal	-	-		468.509		481.779		-		481.779	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace Corporation : El Segundo/CA	-	-		3.838	Jan 2021	4.688	Jan 2022	-		4.688	-	-	-
A&AS	Various	Various : Various	-	-		25.592	Feb 2021	27.760	Feb 2022	-		27.760	-	-	-
Other Support	Various	Various : Various	-	-		0.350	Nov 2020	0.350	Nov 2021	-		0.350	-	-	-
		Subtotal	-	-		29.780		32.798		-		32.798	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		498.289		514.577		-		514.577	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657106 / *Next-Gen OPIR Ground*

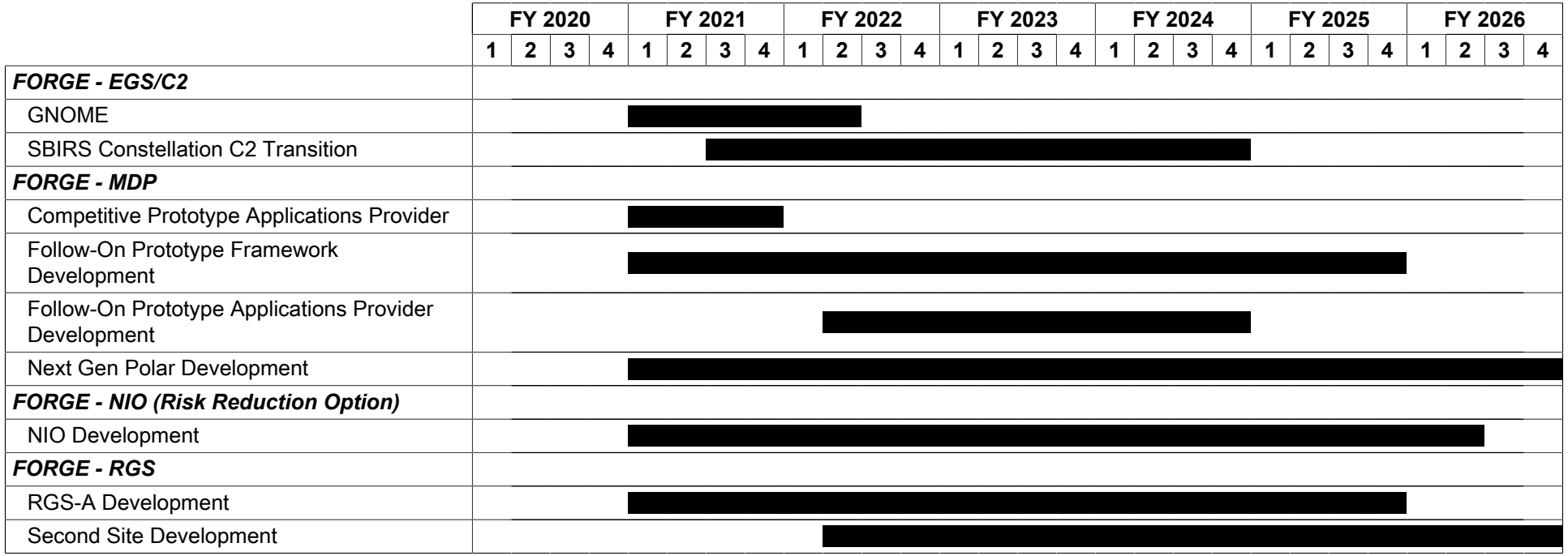

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657106 / *Next-Gen OPIR Ground*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
FORGE - EGS/C2				
GNOME	1	2021	2	2022
SBIRS Constellation C2 Transition	3	2021	4	2024
FORGE - MDP				
Competitive Prototype Applications Provider	1	2021	4	2021
Follow-On Prototype Framework Development	1	2021	4	2025
Follow-On Prototype Applications Provider Development	2	2022	4	2024
Next Gen Polar Development	1	2021	4	2026
FORGE - NIO (Risk Reduction Option)				
NIO Development	1	2021	2	2026
FORGE - RGS				
RGS-A Development	1	2021	4	2025
Second Site Development	2	2022	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / *Next Generation OPIR*	Project (Number/Name) 657120 / *Next-Gen OPIR Space, Block 0 GEO*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
657120: *Next-Gen OPIR Space, Block 0 GEO*	-	0.000	1,128.900	1,137.393	0.000	1,137.393	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Next-Generation Overhead Persistent Infrared (Next-Gen OPIR) Space Block 0 Geosynchronous Earth Orbit (GEO) (Project 657120): The primary mission is to provide initial missile warning of a ballistic missile attack on the US, deployed forces and allies. The Next-Gen OPIR GEO (NGG) missile warning satellites enhance detection and improve reporting of intercontinental ballistic missile launches, submarine ballistic missile launches, and tactical ballistic missile launches. Development consists of new payloads in a highly resilient bus, providing real-time persistent global infrared coverage to meet validated Joint Requirements Oversight Council (JROC) requirements on current and future space domain demands.

The Program Office intends to acquire the NGG capability in two contract actions. Phase 1 awarded in August 2018 encompasses requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR). Phase 2 was awarded in Jan 2021 for the manufacturing, assembly, system integration and test, launch, and early on-orbit test through operational acceptance of NGG satellites 1-3.

Starting in FY 2022, a portion of funding has been transferred from Project 657120, Next Gen OPIR Space, Block 0 GEO, Project 657121 Next Gen OPIR Space, Block 0 Polar, and Project 657106, Next Gen OPIR Ground to Project 657123, Next Generation OPIR Integration to support end-to-end system integration across space, ground and data exchange segments. The focus of the Integration project is on system-level integration requirements between segments such as Space to Ground. This differs from the separately funded Systems Engineering and Integration (SE&I) that is tasked within each segment; SE&I within segments refers to subsystem-level integration between subsystems such as a spacecraft bus to the mission payload.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Next-Gen OPIR Space, Block 0 GEO	-	1,128.900	1,137.393
Description: Development of the Next-Gen OPIR GEO missile warning satellites with a proven bus, new hardened sensors, and auxiliary payloads for increased resilience. The space segment for GEO missile warning satellites consist of a resilient architecture providing real time persistent global equatorial infrared coverage. The first GEO satellite is required in FY 2025.			
FY 2021 Plans: Continue to perform requirements analysis, design/development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR) for GEO satellites in FY 2021. Conduct CDR for the payload to evaluate progress and performance of the payload design. Complete detailed design, ramp-up procurement and integration of the functional test bed. Award the Phase 2 contract modification to begin the manufacture, build, integration, test, and launch of the			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657120 / *Next-Gen OPIR Space, Block 0 GEO*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
GEO SVs. Purchase critical path flight hardware for SVs #2 & 3 under Phase 2 contract award. Continue to purchase required flight hardware for SV #1 and begin build of SV #1 subsystem components following each subsystem CDR. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Complete Phase 1 development on spacecraft bus and up to two competitive flight mission payloads designs. Continue development of ground and spacecraft flight software and mission data processing algorithms. Continue communication system early integration risk reduction demonstrations. Continue component and subsystem integration testing. Complete mission model and simulation development and begin government integration and requirement verification. Complete critical path flight hardware procurement for SV #1. Continue assembly, integration, and test of up to two competitive flight mission payloads for SVs #1 & 2. Continue Phase 2 efforts to manufacture, build, integrate, test, and launch of the GEO SV #1. Continue critical path flight hardware procurement for SVs #2 & 3. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, and prototyping. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased to support increase in simultaneous SV activities and to continue the development of up to two competitive flight mission payloads.			
Accomplishments/Planned Programs Subtotals	-	1,128.900	1,137.393

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Space Force intends to acquire Next-Gen systems in block developments to deliver the required constellation. The first block, Block 0, consists of 3 Next-Gen GEO and 2 Next-Gen Polar satellites. The Next-Gen OPIR Space program has been designated a Middle Tier Acquisition (MTA) Rapid Prototype effort under Section 804 of the 2016 National Defense Authorization Act (NDAA). The purpose of the MTA is to develop and qualify up to two competitive mission payloads. Following completion of the MTA activity, the Next Gen OPIR GEO program developments will transition to Major Capability Acquisition programs. The first GEO satellite is required by FY 2025 and the first Polar satellite is required in FY 2028. The program office awarded two sole source contracts (one to a GEO prime and one to a Polar prime) under the authority of two Justification & Authorization documents. The Next-Gen GEO Phase 1 contract was awarded in FY 2018, consisting of requirements development, critical path flight hardware procurement, and risk reduction efforts culminating in a Sept 2021 Critical Design Review (CDR). The Next-Gen GEO Phase 2 modification was awarded in Jan 2021, and includes scope for parts procurement, assembly, integration, test, launch, and checkout of all 3 GEO space vehicles.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657120 / *Next-Gen OPIR Space, Block 0 GEO*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Next-Gen OPIR Space, Block 0 GEO (Phase 1 & 2)	SS/CPIF	Lockheed Martin : Sunnyvale, CA	-	-		1,069.066	Oct 2020	1,077.880	Oct 2021	-		1,077.880	-	-	-
SE&I	C/CPAF	Engility Corp. : El Segundo, CA	-	-		13.870	Nov 2020	21.830	Nov 2021	-		21.830	-	-	-
Technical Mission Analysis	RO	Aerospace Corp. : El Segundo, CA	-	-		11.003	Oct 2020	15.201	Oct 2021	-		15.201	-	-	-
		Subtotal	-	-		1,093.939		1,114.911		-		1,114.911	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace Corp. : El Segundo, CA	-	-		3.624	Oct 2020	7.756	Oct 2021	-		7.756	-	-	-
A&AS	Various	Various : TBD	-	-		11.352	Feb 2021	14.266	Feb 2022	-		14.266	-	-	-
Other Support	Various	Various : TBD	-	-		19.985	Oct 2020	0.460	Oct 2021	-		0.460	-	-	-
		Subtotal	-	-		34.961		22.482		-		22.482	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		1,128.900		1,137.393		-		1,137.393	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657120 / *Next-Gen OPIR Space, Block 0 GEO*

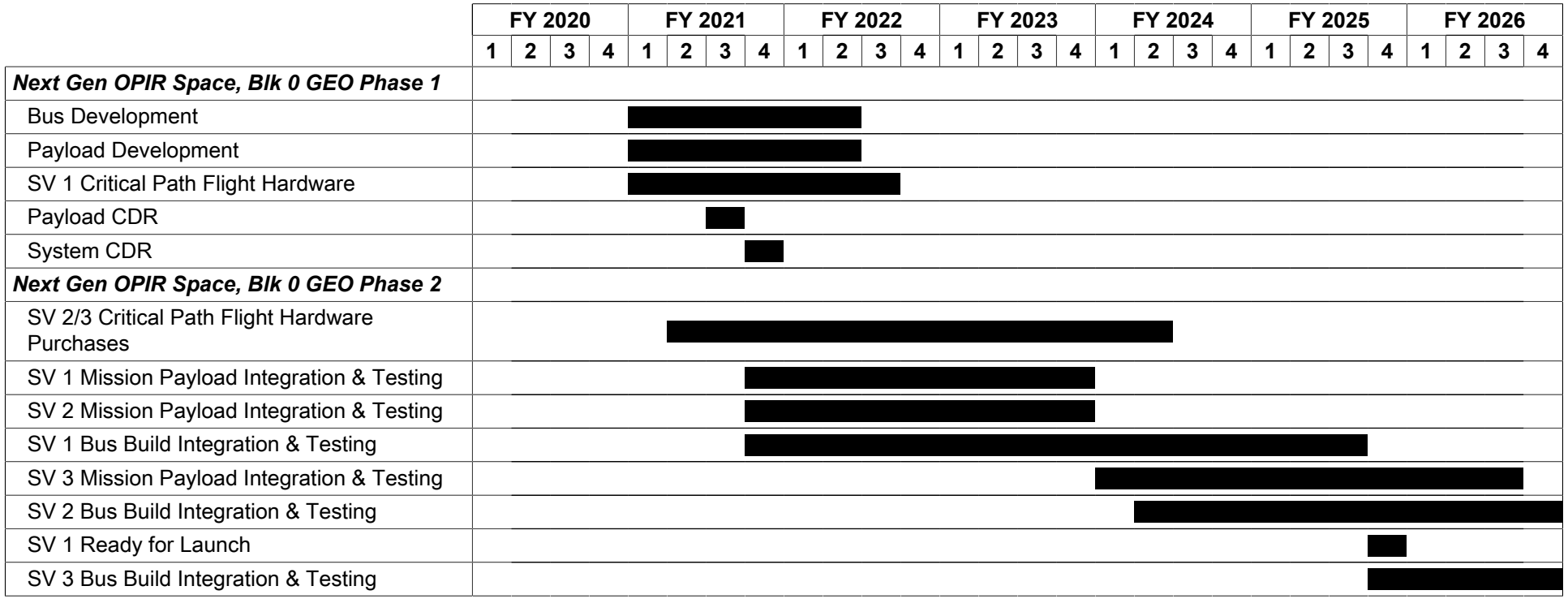

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657120 / *Next-Gen OPIR Space, Block 0 GEO*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Next Gen OPIR Space, Blk 0 GEO Phase 1				
Bus Development	1	2021	2	2022
Payload Development	1	2021	2	2022
SV 1 Critical Path Flight Hardware	1	2021	3	2022
Payload CDR	3	2021	3	2021
System CDR	4	2021	4	2021
Next Gen OPIR Space, Blk 0 GEO Phase 2				
SV 2/3 Critical Path Flight Hardware Purchases	2	2021	2	2024
SV 1 Mission Payload Integration & Testing	4	2021	4	2023
SV 2 Mission Payload Integration & Testing	4	2021	4	2023
SV 1 Bus Build Integration & Testing	4	2021	3	2025
SV 3 Mission Payload Integration & Testing	1	2024	3	2026
SV 2 Bus Build Integration & Testing	2	2024	4	2026
SV 1 Ready for Launch	4	2025	4	2025
SV 3 Bus Build Integration & Testing	4	2025	4	2026

Note

Next-Gen OPIR GEO efforts continue past 2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / *Next Generation OPIR*	Project (Number/Name) 657121 / *Next-Gen OPIR Space, Block 0 Polar*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
657121: *Next-Gen OPIR Space, Block 0 Polar*	-	0.000	482.013	661.098	0.000	661.098	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Next-Generation Overhead Persistent Infrared (OPIR) Space, Block 0 Polar (NGP) (Project 657121): The primary mission is to provide initial missile warning of a ballistic missile attack on the US, its deployed forces, and its allies. Next-Gen OPIR Space enhances detection and improves reporting of intercontinental ballistic missile launches, submarine launched ballistic missile launches, and tactical ballistic missile launches. Development consists of the Next-Gen OPIR Polar missile warning satellites with new payloads in a highly resilient bus, providing real-time persistent global infrared coverage to meet validated Joint Requirements Oversight Council (JROC) requirements on current and future space domain demands.

The Program Office is acquiring the NGP capability through three contract phases. Phase 0 awarded in June 2018, encompassed system requirements analysis and risk reduction efforts, which led to a March 2020 System Requirements Review (SRR). Phase 1 awarded May 2020, encompasses design and development, critical path flight hardware procurement, and risk reduction efforts leading to a System Critical Design Review (CDR) in FY 2024. Phase 2 will be awarded prior to System CDR for the manufacturing, assembly, integration and test, and early on orbit test, through operational acceptance of NGP satellites 1 and 2.

Starting in FY 2022, a portion of funding has been transferred from Projects 657120, 657121, and 657106, to Project 657123, Next Generation OPIR Integration to support end-to-end system integration across space, ground and data exchange segments. The focus of the Integration project is on system-level integration requirements between segments such as Space to Ground. This differs from the separately funded Systems Engineering and Integration (SE&I) that is tasked within each segment; SE&I within segments refers to subsystem-level integration between subsystems such as a spacecraft bus to the mission payload.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Next Gen OPIR Space, Block 0 Polar	-	482.013	661.098
Description: Development of the Next-Gen OPIR Polar missile warning satellites using a proven bus with modifications, auxiliary payloads for improved resiliency, and new hardened sensors. The Polar space segment will consist of two Next-Gen OPIR Polar satellites in a resilient architecture, providing real time persistent infrared coverage of the northern hemisphere.			
FY 2021 Plans: Ramp up Phase 1 activities including systems engineering and software design to ensure a successful Polar System Preliminary Design Review (PDR). Perform analysis for requirements unique to Polar bus and payload. Meet new missile warning requirements by balancing affordability, capability, and resiliency. Continue Phase 1 activities to include design/development, risk reduction efforts, and initial procurement of mission critical flight hardware. Continue efforts leading to a System Critical Design			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657121 / *Next-Gen OPIR Space, Block 0 Polar*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Review (CDR) for Polar Satellites. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, and prototyping. ***FY 2022 Plans:*** Continue Phase 1 systems engineering design activities to ensure a successful Polar System Preliminary Design Review (PDR) by FY 2023. Support enterprise requirements in the development of the Next Gen OPIR System Requirements Document (SRD), Next Gen OPIR Space Segment Specification, and Polar Space Vehicle (SV) Technical Requirements Document (TRD). Mature satellite design by performing analysis for requirements unique to the Polar bus and payload. Conduct Baseline Technical Reviews (BTR) as well as modeling and simulation reviews to ensure satellite mission performance parameters are met. Develop design reference missions as well as conditions and methods documentation to understand power, pointing, thermal, data-rate, data-volume, environment, and ground interface parameters. Specify design updates to resolve any payload interface requirement disconnects. Perform auxiliary payload subsystem (APS) installation in a virtualized System Integration Laboratory (SIL) environment to conduct flight software testing. Refine initial software design, develop test events and initial test plans. Mature security design by performing an iterative review of security controls and establish implementation plans. Continue risk reduction efforts, initial procurement of mission critical flight hardware and test equipment to support systems engineering, cyber, resiliency, and security test events. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, and experimentation, prototyping. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased to support modeling, simulation, and baseline technical reviews for the NGP bus and payload in support of System PDR.			
Accomplishments/Planned Programs Subtotals	-	482.013	661.098

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Space Force intends to acquire Next-Gen systems in block developments to deliver the required constellation. The first block, Block 0, consists of 3 Next-Gen GEO and 2 Next-Gen Polar satellites. The Next-Gen OPIR Space program has been designated a Middle Tier Acquisition (MTA) Rapid Prototype effort under Section 804 of the 2016 National Defense Authorization Act (NDAA). The purpose of the MTA is to develop and qualify up to two competitive mission payloads. Following completion of the MTA activity, the Next Gen OPIR GEO program developments will transition to Major Capability Acquisition programs. The first GEO satellite is required by FY 2025 and the first Polar satellite is required in FY 2028. The program office awarded two sole source contracts (one to a GEO prime and one to a Polar prime) under the

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657121 / *Next-Gen OPIR Space, Block 0 Polar*

authority of two Justification & Authorization documents. The Next-Gen Polar Phase 0 was awarded in FY 2018, consisting of requirements development and culminated in a March 2020 SRR. Phase 1 was awarded May 2020, encompassing requirements review, design, development, critical path flight hardware procurement, and risk reduction efforts leads to a System CDR NLT FY 2024 for Next-Gen Polar Satellite Vehicles (SV) 1 and 2. Phase 2 will be awarded prior to System CDR, encompassing build, integration, test, launch, and transition to operations for Next- Gen Polar SVs 1 and 2.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657121 / *Next-Gen OPIR Space, Block 0 Polar*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Next Gen OPIR Space, Block 0 Polar Phase 1	SS/CPAF	Northrop Grumman : Redondo Beach, CA	-	-		453.859	Oct 2020	630.892	Oct 2021	-		630.892	-	-	-
SE&I	C/CPAF	Engility Corp : El Segundo, CA	-	-		7.455	Dec 2020	7.898	Dec 2021	-		7.898	-	-	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-		6.484	Oct 2020	7.400	Oct 2021	-		7.400	-	-	-
		Subtotal	-	-		467.798		646.190		-		646.190	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace Corp : El Segundo, CA	-	-		2.136	Dec 2020	2.301	Dec 2021	-		2.301	-	-	-
A&AS	Various	Various : Various	-	-		5.837	Feb 2021	6.105	Feb 2022	-		6.105	-	-	-
Other Support	Various	Various : Various	-	-		6.242	Oct 2020	6.502	Oct 2021	-		6.502	-	-	-
		Subtotal	-	-		14.215		14.908		-		14.908	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		482.013		661.098		-		661.098	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657121 / *Next-Gen OPIR Space, Block 0 Polar*

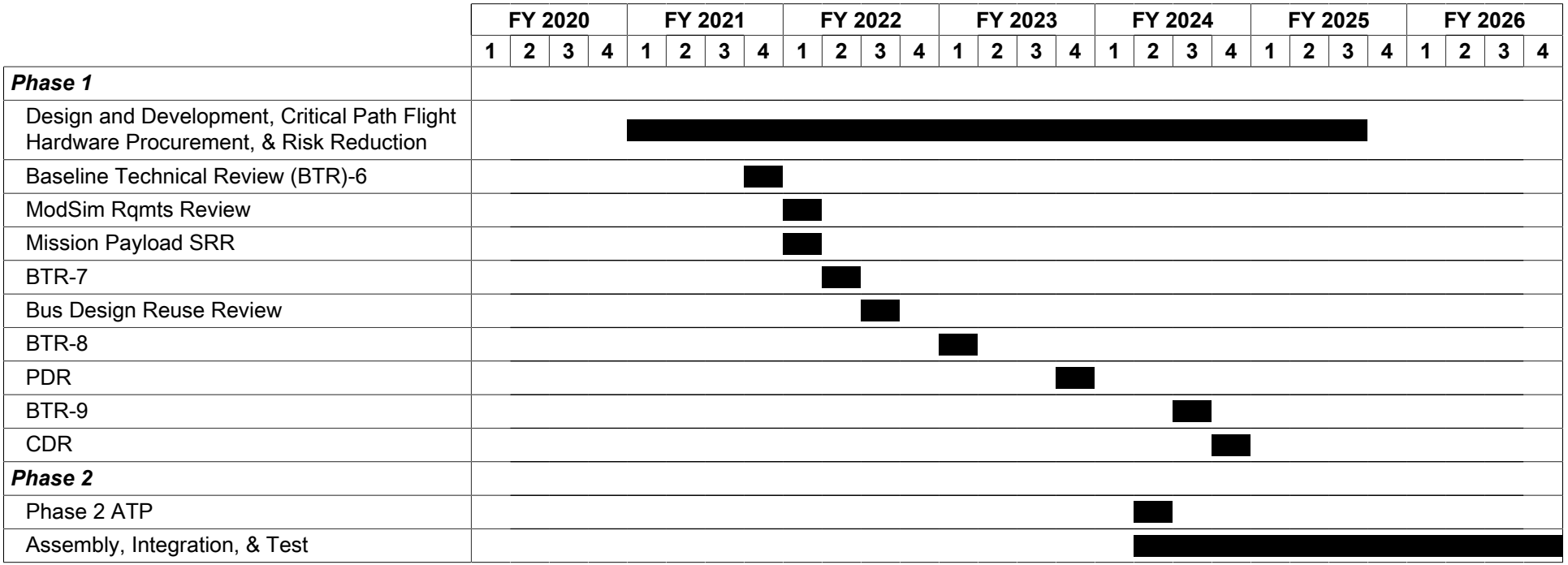

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657121 / *Next-Gen OPIR Space, Block 0 Polar*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Phase 1				
Design and Development, Critical Path Flight Hardware Procurement, & Risk Reduction	1	2021	3	2025
Baseline Technical Review (BTR)-6	4	2021	4	2021
ModSim Rqmts Review	1	2022	1	2022
Mission Payload SRR	1	2022	1	2022
BTR-7	2	2022	2	2022
Bus Design Reuse Review	3	2022	3	2022
BTR-8	1	2023	1	2023
PDR	4	2023	4	2023
BTR-9	3	2024	3	2024
CDR	4	2024	4	2024
Phase 2				
Phase 2 ATP	2	2024	2	2024
Assembly, Integration, & Test	2	2024	4	2026

Note

Note: Next-Gen OPIR Polar efforts continue past 2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / *Next Generation OPIR*	Project (Number/Name) 657123 / *Integration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
657123: *Integration*	-	0.000	0.000	27.875	0.000	27.875	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Starting in FY 2022, a portion of funding has been transferred from Project 657120, Next-Gen OPIR Space, Block 0 GEO, Project 657121, Next Gen OPIR Space, Block 0 Polar, and Project 657106, Next Gen OPIR Ground to Project 657123, Integration to support end-to-end system integration across space, ground, and data exchange segments.

The Government works with the Enterprise SE&I contractor as a team to define the Next Gen OPIR enterprise architecture, control and validate interfaces, ensure compatibility of Next Gen OPIR systems, and develop/manage plans for fielding the Next Gen OPIR segments. Further, the Enterprise SE&I executes system-level integration requirements between segments such as Space to Ground. This differs from integration within each segment; integration within segments refers to subsystem-level integration between subsystems such as a spacecraft bus to the mission payload. The Government Integrator is responsible for defining the Next Gen OPIR enterprise architecture, controls and validates interfaces, ensures compatibility of Next Gen OPIR systems, and develops/manages plans for fielding the Next Gen OPIR Enterprise. Further, the Integrator executes Model Based System Engineering through modeling, simulation, and technical analyses of Government-directed enterprise level trades among the Next Gen OPIR segments. These trades lead to definition, management, maintenance, and evolution of the Next Gen OPIR Enterprise technical requirements and interface documents to ensure the integrity of the enterprise technical baseline.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Next-Gen OPIR Space, Integration	-	0.000	27.875
Description: The Integration (Project 657123) project includes the efforts associated with the Government's primary role and tasks necessary to accomplish the critical lead system integration function with the Next Gen OPIR enterprise material segments (Next Gen GEO, Next Gen Polar and Next Gen Ground) The Next Generation OPIR Program Manager is responsible for directing the Next Gen OPIR current Enterprise architecture, system definition, controls and validates interfaces, ensures compatibility of Next Gen systems, and develops/manages plans for execution and fielding of the Next Gen OPIR Enterprise			
FY 2021 Plans: Integration is not a new start. This major thrust was previously funded within the Next Gen OPIR Ground (Project 657106), Next Gen OPIR Block 0 GEO (Project 657120), and Next Gen OPIR Block 0 Polar (Project 657121) projects.			
FY 2022 Plans: Continue to execute critical System of Systems planning and execution. Scheduled activities: Space-to-ground System level Critical Design Review completion; NGG space-to-ground interface demonstrations; cyber vulnerability assessments; mission unique ground-based payload processors and software integration into FORGE. Plan for major pre-launch enterprise integration events scheduled in 2023. Activities include, but not limited to, management of the technical baseline; continued definition of			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657123 / *Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
space to ground interfaces, Early Integration Demonstration activities, Space to Ground integration and test planning activities, cross-segment engineering trades, and hosted payload integration and test activities. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support studies, technical analysis experimentation, and prototyping. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased to establish a Next Gen OPIR Enterprise Integration function. An allocation of FY 2022 funds were transitioned from Next Gen OPIR Projects under this Program Element to support this new project.			
Accomplishments/Planned Programs Subtotals	-	0.000	27.875

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The Space Force will exercise complete ownership of the architecture, system definition, technical baseline, and integration of NG OPIR space and ground segments. While this complex intersegment integration is traditionally performed by a prime contractor under a systems development contract, for NG OPIR, this approach requires the government to be the integrator. To execute this responsibility, the government leverages systems engineering and integration expertise from both Federally Funded Research and Development Center (FFRDC) contractors and a Systems Engineering and Integration (SE&I) contractor. The Program Office intends to contract for this capability through a Systems Engineering and Integration Advisory and Assistance Services follow-on Contract. There is a contractor finishing the execution of the current SE&I contract in 2021, and the follow-on effort will be a competitive award expected for award in FY 2021. In this effort, the contractor will be tightly integrated with the government team to assist in executing the government lead system integration and validation function.

This contract will encompass two functions: first, it primarily supports the Enterprise SE&I effort captured in this Integration Project. Secondly, the contract includes scope to execute SE&I requirements internal to each segment.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206442SF / *Next Generation OPIR*	Project (Number/Name) 657123 / *Integration*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Enterprise SE&I Direct Support	C/CPAF	TBD : TBD	-	-		-		27.875		-		27.875	-	-	-
		Subtotal	-	-		-		27.875		-		27.875	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		27.875		-		27.875	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657123 / *Integration*

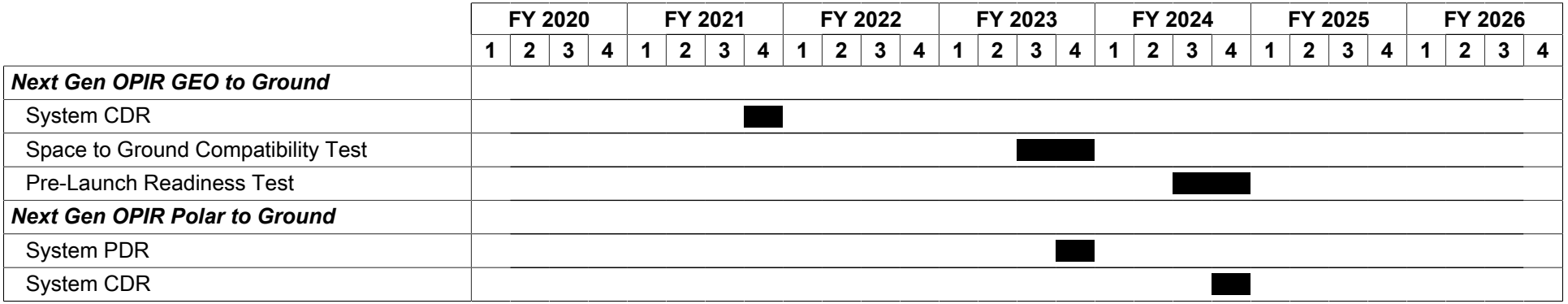

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206442SF / *Next Generation OPIR*	**Project (Number/Name)** 657123 / *Integration*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Next Gen OPIR GEO to Ground				
System CDR	4	2021	4	2021
Space to Ground Compatibility Test	3	2023	4	2023
Pre-Launch Readiness Test	3	2024	4	2024
Next Gen OPIR Polar to Ground				
System PDR	4	2023	4	2023
System CDR	4	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	43.212	23.400	0.000	23.400	-	-	-	-	-	-
650140: *COMSATCOM*	-	0.000	43.212	0.000	0.000	0.000	-	-	-	-	-	-
651126: *COMSATCOM Infrastructure*	-	0.000	0.000	23.400	0.000	23.400	-	-	-	-	-	-

Note

This program, BA 5, PE 1206445SF, project 651126, COMSATCOM Management and Control System of Systems, is a new start.

In FY 2021, PE 1206445F, Commercial Satellite Communication (COMSATCOM) Integration efforts were transferred to Appropriation 3620F, Research, Development, Test & Evaluation, Space Force, PE 1206445SF, COMSATCOM Integration from Appropriation 3600F, Budget Activity, 05 due to the creation of a new Appropriation for Space Force.

In FY 2021, PE 1206431SF, Advanced Extremely High Frequency (EHF) Military Satellite Communication (MILSATCOM) (SPACE), Project 657104, MILSATCOM Space Modernization Initiatives (SMI), Fighting Satellite Communications (SATCOM) efforts were transferred to PE 1206445SF, COMSATCOM Integration, Project 650140, COMSATCOM, for Enterprise Integration of Fighting SATCOM directed by the Congress in the Consolidated Appropriations Act, 2021.

A. Mission Description and Budget Item Justification

In FY 2021 Appropriations, Congress directed the transfer of PE 1206431SF, Advanced EHF MILSATCOM (Space), Fighting Satellite Communications (SATCOM) efforts to PE 1206445SF, COMSATCOM Integration, Enterprise Integration of Fighting SATCOM to provide increased transparency.

Commercial SATCOM Integration develops, prototypes and demonstrates the capabilities required to fully leverage COMSATCOM as part of the Department's SATCOM enterprise. The Space Force has determined that an enterprise approach to the procurement, delivery and management of its SATCOM capabilities is the best means to create an environment that is responsive to Combatant Commanders and other users across the spectrum of conflict. In addition, an enterprise approach will improve affordability, Department purchasing power and mission assurance.

Space acquisition must respond with speed and agility to emerging adversary threats. Space and Missile System Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206445SF *I Commercial SATCOM (COMSATCOM) Integration*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	43.212	23.400	0.000	23.400
Total Adjustments	0.000	43.212	23.400	0.000	23.400
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	43.212			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	23.400	0.000	23.400

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 650140: *COMSATCOM*		
Congressional Add: *Enterprise Integration of Fighting SATCOM*	0.000	43.212
Congressional Add Subtotals for Project: 650140	0.000	43.212
Congressional Add Totals for all Projects	0.000	43.212

Change Summary Explanation

FY 2021: +$43.212M Congressional Directed Transfer from PE 1206431SF, Advanced EHF MILSATCOM (SPACE), BPAC 657104, MILSATCOM SMI.
FY 2022: +$23.400M for Commercial Satellite Communications Office (CSCO) infrastructure supporting transition to USSF.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	Project (Number/Name) 650140 / *COMSATCOM*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
650140: *COMSATCOM*	-	0.000	43.212	0.000	0.000	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021 Appropriations, Congress directed the transfer of PE 1206431SF, Advanced EHF MILSATCOM (Space), Fighting Satellite Communications (SATCOM) efforts to PE 1206445SF, COMSATCOM Integration, Enterprise Integration of Fighting SATCOM to provide increased transparency.

The backbone of Fighting SATCOM is a SATCOM Enterprise management and control capability for an Integrated SATCOM Enterprise. This is the foundation for SATCOM integration into an operational level Command and Control (C2) system that enables the end-to-end "sensor to shooter" execution serving the "protect and defend", as well as theatre support missions for United States Space Command (USSPACECOM) and the Theater Combatant Commands. SATCOM Enterprise Management and Control (EM&C) applications will provide critical services to our warfighters to facilitate timely, quality driven battlespace decisions for SATCOM allocation and use. The effort leverages a Development Security Operations (DevSecOps) platform to rapidly prototype and deliver EM&C mission applications enabling responsive, resilient SATCOM for the Single Warfighting Commander, National Space Defense Center (NSDC), Combined Space Operations Center (CSpOC), SATCOM Integrated Operations Division (SIOD), Regional SATCOM Support Centers (RSSC), Space and Missile Defense Command (SMDC) Satellite Operations Brigade, and other C2 centers. Enterprise-level architecture, prototyping, test, and experimentation will drive Commander's acceptance of capabilities and enable integrated mission systems with machine-to-machine connections.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
Congressional Add: Enterprise Integration of Fighting SATCOM	0.000	43.212
FY 2020 Accomplishments: N/A		
FY 2021 Plans: This is not a New Start, as it transitions the effort from Program Element 1206431SF, Advanced EHF MILSATCOM (Space). FY 2021 prototypes focus on advancing the common data environment and operational picture prototyped in FY 2020 by defining the data path in which the prototypes can deliver. Extensive collaboration across USSPACECOM, United States Space Force (USSF), Space Operations Command and Space and Missile Systems Center (SMC) leaders, operators, suppliers, system developers and acquirers was conducted during the first phase and capabilities were focused on an Enterprise SATCOM Common Operating Picture and Situational Awareness Data. FY 2021 prototypes include improving the user interface/experience, normalizing and integrating global spectrum usage, status of SATCOM systems (ground and space), overlaying SATCOM plans, Electro-Magnetic Interference (EMI) characterization support, and development of SATCOM registries as definitive sources of truth to support Fighting SATCOM. Rapid prototyping and delivering these building blocks enables a digital ground SATCOM Architecture, and supports		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	**Project (Number/Name)** 650140 / *COMSATCOM*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
the Advanced Battle Management System (ABMS) and Joint All Domain Command and Control (JADC2) demonstrations throughout FY 2021. Operationally relevant blocks include providing user profiles for data visualization, a terminal registry, Unified Data Library (UDL) data calls and definitions, integration of relevant electromagnetic interference and current system status, and integration of data visualization applications and tools. COMSATCOM Management and Control family of systems consists of modernized, automated tools for joint warfighter COMSATCOM ordering, activation, monitoring and support, COMSATCOM SA/COP data feeds to facilitate advanced hybrid architectures and EM&C, and ensure compliance with all financial and information technology regulations. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.		
Congressional Adds Subtotals	0.000	43.212

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Fighting SATCOM Enterprise Integration utilizes the Middle Tier of Acquisition authorities by leveraging Other Transaction Authority (OTA) agreement awards through the Space Enterprise Consortium to rapidly develop prototype capabilities in operationally relevant blocks starting in FY 2021. Individual prototype efforts are competitively awarded fixed-price agreements leveraging non-traditional defense contractors.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	**Project (Number/Name)** 650140 / *COMSATCOM*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DevOPs Platform, Systems Integration, Prototyping	Various	Not specified. : TBD	-	-		22.335	Jun 2021	-		-		-	-	-	-
COMSATCOM Management & Control	TBD	Not specified. : TBD	-	-		10.000	Aug 2021	-		-		-	-	-	-
Technical Mission Analysis	MIPR	Aerospace : El Segundo, CA	-	-		1.000	Apr 2021	-		-		-	-	-	-
SE&I	C/CPIF	Linquest : El Segundo, CA	-	-		9.027	Apr 2021	-		-		-	-	-	-
		Subtotal	-	-		42.362		-		-		-	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	Stellar Solutions : El Segundo, CA	-	-		0.800	Apr 2021	-		-		-	-	-	-
Other Support	TBD	Not specified. : TBD	-	-		0.050	Apr 2021	-		-		-	-	-	-
		Subtotal	-	-		0.850		-		-		-	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		43.212		-		-		-	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	**Project (Number/Name)** 650140 / *COMSATCOM*

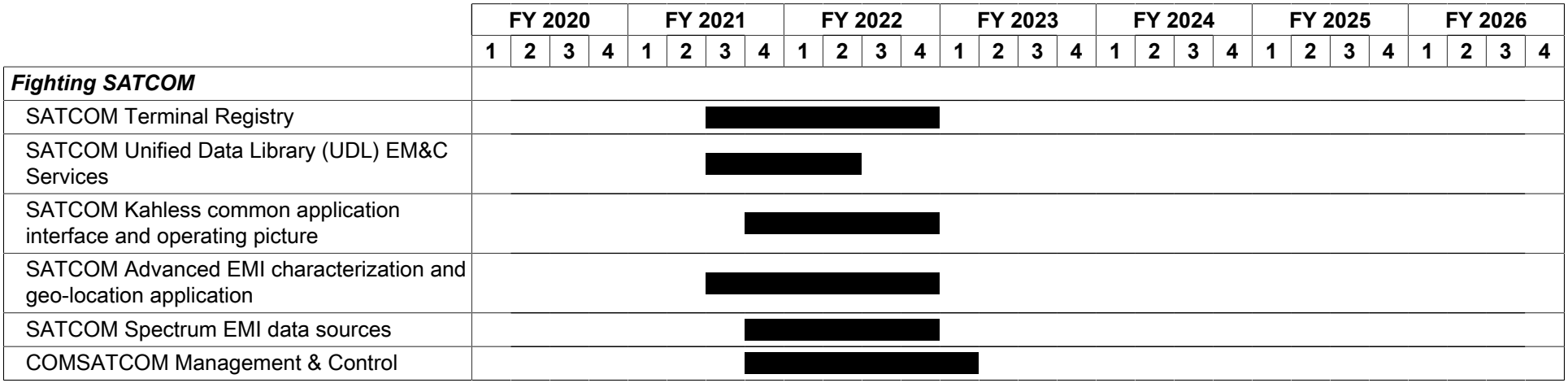

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	**Project (Number/Name)** 650140 / *COMSATCOM*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Fighting SATCOM				
SATCOM Terminal Registry	3	2021	4	2022
SATCOM Unified Data Library (UDL) EM&C Services	3	2021	2	2022
SATCOM Kahless common application interface and operating picture	4	2021	4	2022
SATCOM Advanced EMI characterization and geo-location application	3	2021	4	2022
SATCOM Spectrum EMI data sources	4	2021	4	2022
COMSATCOM Management & Control	4	2021	1	2023

Note

R-4 Schedule/Events reflect only the execution of FY 2021 Congressionally transferred budget authority.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	Project (Number/Name) 651126 / *COMSATCOM Infrastructure*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
651126: *COMSATCOM Infrastructure*	-	0.000	0.000	23.400	0.000	23.400	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 5, PE 1206445SF, project 651126, COMSATCOM Management and Control System of Systems, is a new start.

A. Mission Description and Budget Item Justification

Commercial satellite communication provides a significant amount of the Department's required capacity to meet Combatant Command, Service and Agency requirements. In the FY2018 National Defense Authorization Act, Air Force Space Command (AFSPC) was designated as the sole procurement authority for commercial satellite communication services for the Department of Defense. To support the required transition of COMSATCOM procurement, a memorandum of agreement was codified between the Defense Information System Agency (DISA) and then AFSPC to ensure COMSATCOM services continued uninterrupted during transition efforts. With the standup of the USSF in 2019, this authority transitioned to the USSF. Project 651126, COMSATCOM Infrastructure, will develop and stand up COMSATCOM business and customer management tools, finalizing the migration from DISA systems to USSF systems. Development of enhanced COMSATCOM acquisition capabilities leverage enterprise innovation activities focused on transforming how DOD acquires, accesses and deploys COMSATCOM capabilities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: COMSATCOM Management and Control System of Systems	-	0.000	23.400
Description: The subject Research, Development, Test and Evaluation (RDT&E) funds will be executed by the Space and Missile Systems Center, and will be used to stand up mission-critical COMSATCOM support systems, thereby enabling a transformational change to the acquisition of Commercial SATCOM, increasing speed to service, improving quality of service, reducing cost, and laying the foundation to incorporate new industry innovations into the future. This activity will transition and enhance the existing COMSATCOM customer-facing tools and background financial management data systems from DISA to the Space Force. An enhanced system of tools is required to automate and securely distribute COMSATCOM services and capabilities to stakeholders, in order to improve the ordering, billing, activation, provisioning, and other financial management tasks currently leveraging limited DISA capability.			
FY 2021 Plans: N/A.			
FY 2022 Plans: Funding in FY2022 will develop USSF financial management systems, integrate commercial SATCOM Management and Control (CM&C) systems, and build the applications that populate the Commercial Satellite Communication Office (CSCO) Marketplace.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	**Project (Number/Name)** 651126 / *COMSATCOM Infrastructure*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The Financial Management System encompasses the finance and accounting capabilities required to manage and report CSCO working capital fund business such as invoicing, payments and rate tracking. CM&C Integration provides the processes and capabilities needed to interconnect all relevant and applicable sub-systems and components, to include those owned and operated by other organizations and commercial providers, to facilitate enterprise connectivity. The CSCO Marketplace will consist of applications required by customers to order and/or activate products and services. The CSCO Marketplace also includes 24/7 customer support. Activities may include, but are not limited to program office support, studies, non-recurring engineering, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased from FY 2021 due to the New Start of Project 651126, COMSATCOM Infrastructure			
Accomplishments/Planned Programs Subtotals	-	0.000	23.400

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The acquisition strategy is to perform competitive awards to qualified vendors via multiple contracting authorities. Efforts will include required compliance tools and processes supporting existing business models, necessary operational readiness updates to existing equipment, and other services required to implement the transition from DISA to USSF. Contracts will be competitively awarded, utilizing a to be determined contract type.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	**Project (Number/Name)** 651126 / *COMSATCOM Infrastructure*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Financial Management System	C/TBD	National Capital Region : TBD	-	-		-		7.000	Dec 2021	-		7.000	-	-	-
CSCO Marketplace	C/TBD	National Capital Region : TBD	-	-		-		10.000	Mar 2022	-		10.000	-	-	-
CM&C Integration	C/TBD	National Capital Region : TBD	-	-		-		4.400	May 2022	-		4.400	-	-	-
		Subtotal	-	-		-		21.400		-		21.400	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	National Capital region : TBD	-	-		-		2.000	Nov 2021	-		2.000	-	-	-
		Subtotal	-	-		-		2.000		-		2.000	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		23.400		-		23.400	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	**Project (Number/Name)** 651126 / *COMSATCOM Infrastructure*

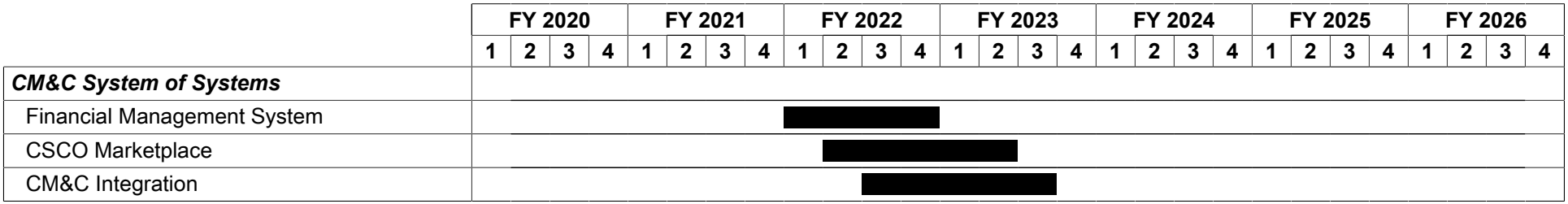

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206445SF / *Commercial SATCOM (COMSATCOM) Integration*	**Project (Number/Name)** 651126 / *COMSATCOM Infrastructure*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
CM&C System of Systems				
Financial Management System	1	2022	4	2022
CSCO Marketplace	2	2022	2	2023
CM&C Integration	3	2022	3	2023

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206853SF *I National Security Space Launch Program (SPACE) - EMD*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	550.978	221.510	0.000	221.510	-	-	-	-	-	-
650006: *Next Generation Launch System Investment*	-	0.000	550.978	221.510	0.000	221.510	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The National Security Space Launch (NSSL) program provides a space launch service that satisfies the government's National Launch Forecast (NLF) requirements to place National Security Space (NSS) space vehicles on orbit. NSSL is a launch service, not a weapon system, which is primarily funded with production funds.

NSSL Phase 2 development, started late FY 2014, funds research and development activities and related studies, to include, but not limited to, investments in new and/or upgraded launch systems and associated launch facilities to meet NSS launch needs leveraging domestic commercial launch providers. The RDT&E program will also fund continued research and development activities, mission manifest capability development & future studies for emerging NSS launch needs. These efforts will provide enabling technologies for launch service procurement planned to begin in FY 2025; help sustain the U.S. industrial base; address emergent needs for launch-related space access and lower procurement costs by promoting competition.

The Space Force will continue investments in the Launch Service Agreement (LSA) public-private partnership with United Launch Alliance Vulcan Centaur for launch system development. In addition, the Space Force will complete rocket propulsion system (RPS) with Aerojet Rocketdyne for the RL10 upper stage engine development and the associated technical maturation program. Future development to capitalize on new technology and innovations developed by industry may continue to utilize public-private partnerships. The Space Force will also be leveraging opportunities to integrate Department of Defense payloads on to launch services procured commercially or by other Government agencies (e.g. NASA) where excess margin is available.

Space acquisition must respond with speed and agility to emerging adversary threats. Space and Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or re-purpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver NSSL system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206853SF *I National Security Space Launch Program (SPACE) - EMD*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	560.978	287.258	0.000	287.258
Current President's Budget	0.000	550.978	221.510	0.000	221.510
Total Adjustments	0.000	-10.000	-65.748	0.000	-65.748
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-100.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	90.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-65.748	0.000	-65.748

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 650006: *Next Generation Launch System Investment*		
Congressional Add: *Next Generation Rocket Engine Testing*	0.000	15.000
Congressional Add: *Upper Stage Resiliency Enhancements*	0.000	75.000
Congressional Add Subtotals for Project: 650006	0.000	90.000
Congressional Add Totals for all Projects	0.000	90.000

Change Summary Explanation

FY 2021: [-10.000M] total, -100.000M for LSA award adjustment, +15.000M for program increase next generation rocket engine testing, +75.000M program increase - upper stage resiliency enhancements
FY 2022: -65.748M: Reduction for higher USSF priorities (-$63.000M) and Inflation Adjustment (-$2.748M)

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: NSSL Enabling Investments	-	0.000	36.743
Description: Enabling Investments are a continuous portfolio of RDT&E projects that will increase U.S. space dominance through the end of the decade and beyond. The portfolio consists of multiple public-private partnerships to develop technologies for space access, mobility, and logistics (SAML). Examples include, but are not limited to, orbital transfer, on-orbit servicing, digital engineering, and novel on-orbit propulsion technologies.			
FY 2021 Plans:			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206853SF *I National Security Space Launch Program (SPACE) - EMD*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
This is not a new start. The effort in this major thrust was previously captured in Congressional Add: Upper Stage Resiliency Enhancements and Congressional Add: Next Generation Rocket Engine Testing in this PE. ***FY 2022 Plans:*** Launch Enterprise will continue its SAML RDT&E agreements awarded in FY21, including work on upper stage resiliency enhancements and next generation rocket engine testing. Additional enabling technology agreements will be awarded in FY 2022 within the SAML as the requirements evolve and are defined. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY2022 increase compared to FY2021 because funding is now included as a separate thrust for improved visibility.			
Title: Launch Service Agreement ***Description:*** Invest in providers of domestic Launch Services. This investment enables the transition from the use of non-Allied space launch engines to commercial launch services that also meet NSS needs. Execute Other Transaction Authority (OTA) agreements to develop various industry solutions utilizing public-private partnerships. Continued the technical maturation and risk reduction activities in support of Launch Service OTAs. ***FY 2021 Plans:*** Continue investments with public-private partnerships with domestic launch providers for the development of new launch systems or upgrades to existing launch systems. This investment is intended to meet NSS launch needs by leveraging 2 domestic, commercial launch providers. This investment includes RPS and associated technical maturation and risk reduction activities. Activities may include, but are not limited to, program office support, studies, technical analysis, prototyping, etc. LSA profile is based on the CY 2020 award of Phase 2 with LSA efforts continuing with two service providers. Until the Phase 2 award, the LSA funding cannot be broken out by provider due to the competitive nature of this acquisition strategy. Future development to capitalize on new technology and innovations developed by commercial space may continue to utilize public-private partnerships. The program was increased to properly execute the LSAs based on milestone projections. ***FY 2022 Plans:*** Continue NSSL Phase 2 public-private partnership investment with United Launch Alliance (ULA) for the development of the Vulcan Centaur launch system. This investment includes completion of Initial Operational Capability activities, continued development for the heavy lift variant (Category C) of the Vulcan Centaur, including Critical Design Review, and initiation of West Coast launch complex improvements. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:***	-	452.178	178.453

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206853SF *I National Security Space Launch Program (SPACE) - EMD*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2022 decrease compared to FY 2021 is due to the off-ramp of Blue Origin and Northrop Grumman LSAs and down select to only ULA for Phase 2.			
Title: Rocket Propulsion System Development ***Description:*** Invest in domestic rocket propulsion systems (RPS) under the Launch Service Agreement Other Transaction Authority (OTA) agreements. This investment enables the transition from the use of non-Allied space launch engines to domestic rocket propulsion systems. Continue to execute a single RPS OTA agreement utilizing a public-private partnership. ***FY 2021 Plans:*** Continuing to execute public-private partnership for an industry upper stage engine common to multiple launch service providers, ensuring a domestic, cost-effective solution. Conduct three programmatic milestones in FY 2021. ***FY 2022 Plans:*** Conclude public-private partnership with Aerojet Rocketdyne for upper stage engine development, ensuring an available, domestic, cost-effective solution. This investment includes completion of development engine qualification testing. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The FY 2022 decrease compared to FY 2021 is due to planned completion of RPS programmatic milestones and completion of payment for those milestones in FY 2021.	-	8.800	6.314
Accomplishments/Planned Programs Subtotals	-	460.978	221.510

	FY 2020	FY 2021
Congressional Add: Next Generation Rocket Engine Testing ***FY 2020 Accomplishments:*** N/A ***FY 2021 Plans:*** Launch enterprise will execute FY 2021 legislation by competitively awarding engine testing prototype projects to potential NSSL phase three providers. As part of the enabling investments portfolio, the Program plans to award one Other Transaction Authority Agreements using the Space Enterprise Consortium by the end of FY 2021.	0.000	15.000
Congressional Add: Upper Stage Resiliency Enhancements ***FY 2020 Accomplishments:*** N/A ***FY 2021 Plans:*** Launch enterprise will execute FY 2021 legislation by competitively awarding engine testing prototype projects to potential NSSL phase three providers. As part of the enabling investments portfolio, the	0.000	75.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206853SF *I National Security Space Launch Program (SPACE) - EMD*

	FY 2020	FY 2021
Program plans to award one or more Other Transaction Authority Agreements using the Space Enterprise Consortium by the end of FY 2021.		
Congressional Adds Subtotals	0.000	90.000

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPSF 01 NSSL00: *National Security Space Launch*	-	996.371	1,337.347	-	1,337.347	-	-	-	-	-	-

Remarks

E. Acquisition Strategy

Launch Enterprise will continue execution of NSSL Phase 2 Public-Private Partnership investments and NSSL Enabling Investments, including those for Next Generation Rocket Engine Testing and Upper Stage Resiliency Enhancements. Phase 2 consists of RDT&E investment in commercial launch system prototypes developed via the Space Force's Launch Service Agreements (LSAs) and Rocket Propulsion System (RPS) Other Transaction Authority (OTA) agreements to ensure two domestic launch service providers are certified to meet all NSS requirements. Phase 2 ends the use of the Russian RD-180 engine and leverages the U.S. launch industry to meet more stressing national security needs. This strategy ensures space launch operations meet requirements for Assured Access to Space (AATS) codified in 10 USC 2273 and Congressional direction to end U.S. reliance on non-allied propulsion systems. Enabling Investments, initiated by Congressional Adds, in FY 2021, are developing advanced space access, mobility and logistics capabilities for launch services planned to start in FY 2025. Enabling Investments support launch innovation to maintain American leadership in launch capabilities through the end of the decade and beyond.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206853SF / *National Security Space Launch Program (SPACE) - EMD*	**Project (Number/Name)** 650006 / *Next Generation Launch System Investment*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
RPS OTA	C/Various	Aerojet Rocketdyne : Canoga Park, CA	-	-		8.800	Nov 2020	6.336	Nov 2021	-		6.336	-	-	-
LSA OTA1	C/Various	United Launch Alliance : Denver, CO	-	-		315.032	Nov 2020	144.498	Nov 2021	-		144.498	-	-	-
LSA OTA2	C/Various	Blue Origin : Kent, WA	-	-		36.000	Nov 2020	-		-		-	-	-	-
LSA OTA3	C/Various	Northrop Grumman : Chandler	-	-		40.340	Nov 2020	-		-		-	-	-	-
FFRDC Mission Assurance	SS/ Various	Aerospace : El Segundo, CA	-	-		20.239	Nov 2020	9.618	Dec 2021	-		9.618	-	-	-
Launch Enterprise System Engineering and Integration	C/CPFF	Various : various	-	-		19.448	Mar 2021	7.928	Nov 2021	-		7.928	-	-	-
Congressional Add Next Generation Rocket Engine Testing	C/Various	TBD : TBD	-	-		15.000	Jul 2021	-		-		-	-	-	-
Congressional Add Upper Stage Resiliency Enhancements	C/Various	TBD : TBD	-	-		75.000	Jul 2021	-		-		-	-	-	-
NSSL Enabling Investments	C/Various	TBD : TBD	-	-		-		36.870	Nov 2021	-		36.870	-	-	-
		Subtotal	-	-		529.859		205.250		-		205.250	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Organic Civilian Support	Reqn	DOD : El Segundo, CA	-	-		2.046	Oct 2020	2.079	Oct 2021	-		2.079	-	-	-
		Subtotal	-	-		2.046		2.079		-		2.079	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 5	R-1 Program Element (Number/Name) PE 1206853SF / *National Security Space Launch Program (SPACE) - EMD*	Project (Number/Name) 650006 / *Next Generation Launch System Investment*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	SS/ Various	Aerospace : El Segundo, CA	-	-		1.053	Nov 2020	1.085	Dec 2021	-		1.085	-	-	-
Advisory and Assistance Services	Various	Various : Various	-	-		6.496	Dec 2020	6.665	Nov 2021	-		6.665	-	-	-
Other Support	Various	Various : Various	-	-		11.524	Nov 2020	6.431	Nov 2021	-		6.431	-	-	-
		Subtotal	-	-		19.073		14.181		-		14.181	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		550.978		221.510		-		221.510	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206853SF / *National Security Space Launch Program (SPACE) - EMD*	**Project (Number/Name)** 650006 / *Next Generation Launch System Investment*

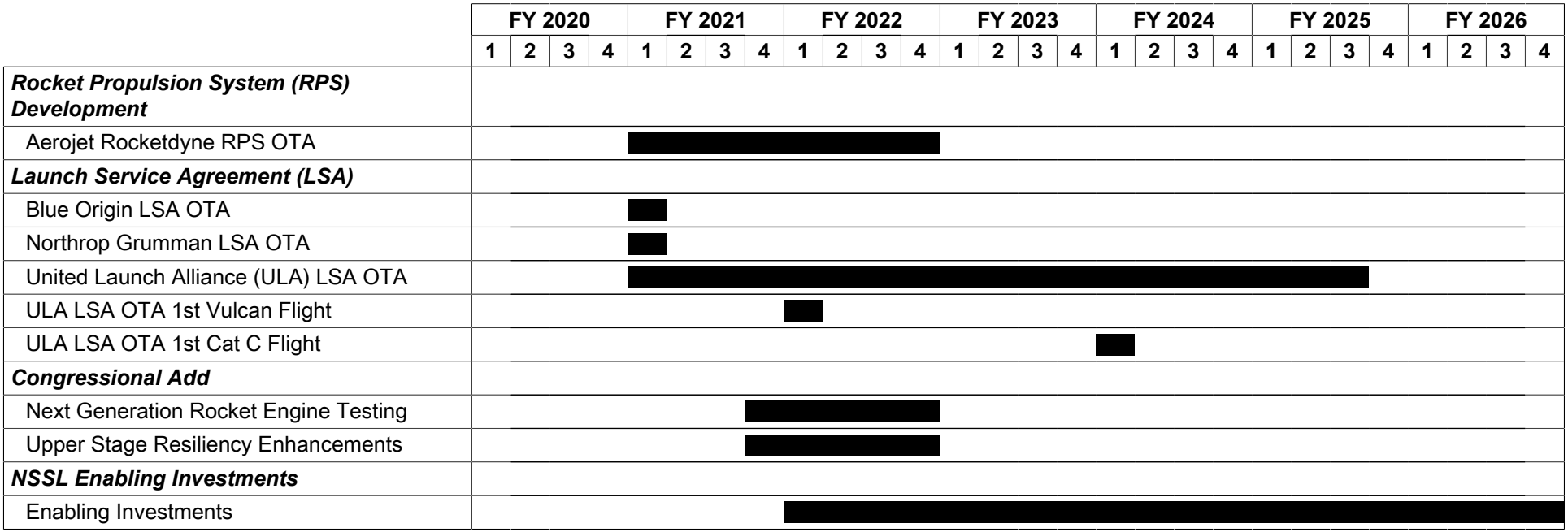

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 5	**R-1 Program Element (Number/Name)** PE 1206853SF / *National Security Space Launch Program (SPACE) - EMD*	**Project (Number/Name)** 650006 / *Next Generation Launch System Investment*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Rocket Propulsion System (RPS) Development				
Aerojet Rocketdyne RPS OTA	1	2021	4	2022
Launch Service Agreement (LSA)				
Blue Origin LSA OTA	1	2021	1	2021
Northrop Grumman LSA OTA	1	2021	1	2021
United Launch Alliance (ULA) LSA OTA	1	2021	3	2025
ULA LSA OTA 1st Vulcan Flight	1	2022	1	2022
ULA LSA OTA 1st Cat C Flight	1	2024	1	2024
Congressional Add				
Next Generation Rocket Engine Testing	4	2021	4	2022
Upper Stage Resiliency Enhancements	4	2021	4	2022
NSSL Enabling Investments				
Enabling Investments	1	2022	4	2026

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206116SF / *Space Test and Training Range Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	20.281	19.319	0.000	19.319	-	-	-	-	-	-
666156: *Space Test and Training Range Development*	-	0.000	20.281	19.319	0.000	19.319	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Supports the development of Space Test and Training Range (STTR) capabilities critical for developmental and operational test, training, exercises and tactics development for Space Control systems and Joint National Space Architecture. Includes development, demonstration and delivery of test assets, special test equipment, capabilities and systems required to test, validate, and verify performance of integrated space control systems. Provides a safe, secure, controllable and repeatable environment for the testing of space control mission systems and training operators in both realistic and relevant environments. Additionally, using an agile incremental development approach for range capabilities, this program develops test range assets for both the fixed node Space Range Operations Center (SROC) at Schriever Space Force Base and a deployable Signal Monitoring Unit capability to support complex Joint and AF exercises. The virtual range as part of the Family of Systems (FoS), called Advanced Threat Simulation Environment (ATSE) virtual range, is being developed to accomplish the STTR mission. ATSE integrates to a Distributed Mission Architecture, tying into cyber, air, and space ranges for increased realism and complexity required to prepare space operators for real-world threats. This technology will allow for the first-ever use of a realistic signal environment to increase the realism and efficiency of space control squadron training. Additionally, the STTR Next Space Orbital Engagement (OE) range risk reduction projects will analyze, prototype, and demonstrate potential range systems that are used to support the testing and training of new advanced development space systems, advanced training for space operator orbital engagement maneuvers and future exercises. These risk reduction activities will include on-orbit capabilities, ground components, communication between nodes, and other required infrastructure.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver STTR weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

The FY 2022 funding request was reduced by $1.150 million to account for the availability of prior year execution balances.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206116SF *I Space Test and Training Range Development*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	20.281	20.709	0.000	20.709
Current President's Budget	0.000	20.281	19.319	0.000	19.319
Total Adjustments	0.000	0.000	-1.390	0.000	-1.390
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-1.390	0.000	-1.390

Change Summary Explanation

FY 2022: -$1.150M due to execution

FY 2022: -$0.240M due to inflation adjustments

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Range Control	0.000	20.281	19.319

Description: Continue development of virtual range integration with cyber and air ranges hosting network emulators and other environments allowing tactics, techniques, and procedures (TTP) development, realistic operational testing, and enable more realistic exercises integrating joint air, space and cyber effects. Continue risk reduction/mitigation efforts for Space Orbital Engagement Range Risk Reduction Projects which will analyze, prototype and demonstrate potential range systems that will be used to support the live and virtual testing of new advanced development space systems, space operator orbital engagement maneuvers (OEM) advanced training, and future SPACE FLAG exercises using live and virtual systems. Continue overhaul of fixed range capabilities, replacement of obsolete equipment, outdated servers, and performing software upgrades focusing on updating signal monitoring hardware with visualization tools and new monitoring capabilities and cybersecurity automation. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Acquire additional system capability to enable and enhance training against new and emerging adversarial assets, to integrate mission scenarios into one graphic user interface, to integrate training into joint operations across multi-domain training events, to reduce size, weight, and power, and to replace software defined radio cards. Integrate joint DoD solutions for counterspace and space superiority effects.

FY 2021 Plans:

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206116SF *I Space Test and Training Range Development*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue development of virtual range integration with cyber and air ranges hosting network emulators and other environments allowing tactics, techniques, and procedures (TTP) development, realistic operational testing, and enable more realistic exercises combining air, space and cyber effects. Continue Interim Contractor support (ICS) of virtual range. Continue risk reduction/ mitigation efforts for Space Orbital Engagement Range Risk Reduction Projects which will analyze, prototype and demonstrate potential range systems that will be used to support the live and virtual testing of new advanced development space systems, space operator orbital engagement maneuvers (OEM) advanced training, and future SPACE FLAG exercises using live and virtual systems. Continue overhaul of fixed range capabilities, replacement of obsolete equipment, outdated servers, and performing software upgrades focusing on updating signal monitoring hardware with visualization tools and new monitoring capabilities and migrating to Linux for automation of cybersecurity. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Acquire additional system capability for new and emerging adversarial assets and replace obsolete equipment to reduce sustainment costs. Integrate joint DoD solutions for counterspace and space superiority effects. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events.			
FY 2022 Plans: Develop new range future framework capability to integrate into the Joint Space Enterprise Architecture (JSpEA) to replace end-of-life equipment and aged software making up the Space Range Operations Center and signal monitoring units. Expand range mission to increase/enhance capabilities and operations to keep up with current and emerging space threats. Develop range to utilize a common baseline, common user interface (UI), and common tools to operate under a common system architecture. Integrate joint DoD solutions for counterspace and space superiority effects. Consolidate range into a single sustainable baseline for family of systems under the JSpEA. Continue development of virtual range integration with cyber and air ranges hosting network emulators and other environments allowing tactics, techniques, and procedures (TTP) development, realistic operational testing, and enable more realistic exercises combining air, space, and cyber effects. Continue Interim Contractor support (ICS) of virtual range. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc.			
FY 2021 to FY 2022 Increase/Decrease Statement:			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206116SF *I Space Test and Training Range Development*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2022 decreased compared to FY 2021 due to an inflation adjustment and execution reduction due to prior year carryover.			
Accomplishments/Planned Programs Subtotals	0.000	20.281	19.319

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

All contracts funded in this program element will be awarded using competitive procedures to the maximum extent possible.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206392SF *I ACQ Workforce - Space & Missile Systems*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	183.930	214.051	0.000	214.051	-	-	-	-	-	-
664280: *SMC Civilian Pay*	-	0.000	183.930	214.051	0.000	214.051	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Space and Missile Systems Center (SMC) equips US and allied forces with operational space and missile systems, launch systems, and command and control infrastructure in support of global military and national security operations. SMC operates with over 6,300 people and an annual budget exceeding 6.4B providing joint warfighters navigation, communication, weather, warning, force application, and space control capabilities.

SMC is authorized to employ approximately 1,897 civilian acquisition professionals providing the management, tools, and technical capabilities needed to oversee acquisition programs to include materiel solution analysis, technology development, engineering and manufacturing development, production and deployment, and operations and support. This funding does not include costs for base operating support civilian personnel supporting the Los Angeles AFB 61 Air Base Group. Funding SMC civilian payroll from the RDT&E appropriation provides program managers the flexibility to hire additional civilian personnel with program dollars versus additional contractors in concert with initiatives in response to the Defense Acquisition Workforce Improvement Act. This program element supports both civilian pay and non-pay support requirements.

In FY 2021 $183.930M was expended for civilian pay expenses in this program element.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206392SF *I ACQ Workforce - Space & Missile Systems*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	183.930	177.201	0.000	177.201
Current President's Budget	0.000	183.930	214.051	0.000	214.051
Total Adjustments	0.000	0.000	36.850	0.000	36.850
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	36.850	0.000	36.850

Change Summary Explanation

FY 2022: +$36.850 due to repricing actions

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: SMC Acquisition Workforce	0.000	183.930	214.051

Description: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center programs. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc.

FY 2021 Plans:

Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center programs.

FY 2022 Plans:

Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center programs.

FY 2021 to FY 2022 Increase/Decrease Statement:

FY 2022 increased compared to FY 2021 due to repricing.

In FY 2021 $192.2M was used in total compensation and benefits for 1,300 civilian full time equivalents with an $153.7K average work year salary.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206392SF *I ACQ Workforce - Space & Missile Systems*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
In FY 2022 $214.1M will be used in total compensation and benefits for 1,468 civilian full time equivalents with an $153.0K average work year salary.			
Accomplishments/Planned Programs Subtotals	0.000	183.930	214.051

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206398SF *I Space & Missile Systems Center - MHA*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	9.765	12.119	0.000	12.119	-	-	-	-	-	-
664280: *SMC Civilian Pay*	-	0.000	9.765	12.119	0.000	12.119	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Space and Missile Systems Center (SMC) equips US and allied forces with operational space and missile systems, launch systems, and command and control infrastructure in support of global military and national security operations. SMC operates with over 6,300 people and an annual budget exceeding 6.4B providing joint warfighters navigation, communication, weather, warning, force application, and space control capabilities.

Program Element 1206398F, Project: 664281 Space and Missile Systems Center - Major Headquarters Activities (MHA) was established to improve overall performance, strengthen business operations, and achieve efficiencies, effectives and cost savings that can be transferred to higher priority needs. PE adds approximately 75 acquisition professionals.

In FY 2021 $9.765M was expended for civilian pay expenses in this program element.

Space acquisition must respond with speed and agility to emerging adversary threats. SMC has transformed the organization and implementation of space acquisition to an enterprise approach, maximizing innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206398SF *I Space & Missile Systems Center - MHA*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	9.765	10.723	0.000	10.723
Current President's Budget	0.000	9.765	12.119	0.000	12.119
Total Adjustments	0.000	0.000	1.396	0.000	1.396
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	1.396	0.000	1.396

Change Summary Explanation

FY 2022: +$1.396 for repricing actions

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: SMC - Major Headquarters Activities	0.000	9.765	12.119

Description: Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center Management Headquarters Activities. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to SMC Staff support, studies, technical analysis, prototyping, etc.

FY 2021 Plans:

Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center Management Headquarters Activities.

FY 2022 Plans:

Provide professional government civilian acquisition workforce in support of all Space and Missile Systems Center Management Headquarters Activities.

FY 2021 to FY 2022 Increase/Decrease Statement:

FY 2022 increased compared to FY 2021 due to repricing.

In FY 2021 $10.7M was used in total compensation and benefits for 70 civilian full time equivalents with an $148.0K average work year salary.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206398SF *I Space & Missile Systems Center - MHA*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
In FY 2022 $12.1M will be used in total compensation and benefits for 75 civilian full time equivalents with an $152.0K average work year salary.			
Accomplishments/Planned Programs Subtotals	0.000	9.765	12.119

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 6: *RDT&E Management Support*					R-1 Program Element (Number/Name) PE 1206759SF / *Major T&E Investment - Space*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	71.503	0.000	71.503	-	-	-	-	-	-
660191: *Initial Operational Test and Eval*	-	0.000	0.000	1.442	0.000	1.442	-	-	-	-	-	-
664597: *Air Force Test Investments*	-	0.000	0.000	70.061	0.000	70.061	-	-	-	-	-	-

Note

This program, BA 6, PE 1206759SF, project 660191, Space Systems Operational Test and Evaluation (OT&E), is a new start.
This program, BA 6, PE 1206759SF, project 664597, Space Force Test Investments, is a new start.

A. Mission Description and Budget Item Justification

This PE provides funds for space test infrastructure and threat testing capabilities within United States Space Force (USSF). Space Test Infrastructure refers to the development and integration of technical capabilities to include digital, terrestrial and space-based, in order to deploy a minimum viable level of ability to test and evaluate the capability and survivability of DoD Space systems in a contested environment.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to develop, sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	71.503	0.000	71.503
Total Adjustments	0.000	0.000	71.503	0.000	71.503
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	71.503	0.000	71.503

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206759SF *I Major T&E Investment - Space*

Change Summary Explanation

FY22 funding increase of $71.5 million is the result of transferring programmed funding from existing program elements: 64759F, Major T&E Investment, of $70.043M and 65712F, Initial Operational Test and Evaluation, of $1.46 million to United States Space Force (USSF) for developmental and operational testing of USSF capabilities and assets and an inflation adjustment.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 6	R-1 Program Element (Number/Name) PE 1206759SF / *Major T&E Investment - Space*	Project (Number/Name) 660191 / *Initial Operational Test and Eval*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
660191: *Initial Operational Test and Eval*	-	0.000	0.000	1.442	0.000	1.442	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 6, PE 1206759SF, project 660191, Space Systems Operational Test and Evaluation (OT&E), is a new start.

A. Mission Description and Budget Item Justification

Space Operational Test and Evaluation refers to Congressionally mandated Space Initial Operational Test and Evaluation (IOT&E) to support major weapon system acquisition decisions beyond Low-Rate Initial Production (LRIP), Milestone C, full rate production, fielding, and declaration of Initial Operational Capability (IOC). For Major Defense Acquisition Programs (MDAP), the law requires IOT&E be completed under realistic operating conditions before proceeding beyond LRIP. IOT&E will be planned to answer all critical operational issues (COI) as thoroughly as possible. IOT&E is conducted to determine the operational effectiveness and suitability and resolve overall mission capability of systems undergoing research and development (R&D) efforts. It 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 funds the USSF Operational Test Agency's participation in Integrated Test and Evaluation (IT&E), Multiservice Operational Test and Evaluation (MOT&E), and Follow-on Operational Test and Evaluation (FOT&E) when it is the continuation of IOT&E activities past the full rate production decision. FOT&E answers specific questions about unresolved COIs and test issues or completes areas not finished during the IOT&E. This effort also funds related operational test and evaluation (OT&E) activities such as Early Influence, Operational Utility Evaluations (OUE), Early Operational Assessments (EOA), and Operational Assessments (OA) which are independent OT&Es supporting major milestones and decision points prior to Milestone C, full rate production, fielding, or declaration of IOC. USSF schedules and executes tests according to the forecasted test readiness of the MDAP program offices.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to develop, sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Space Systems Operational Test and Evaluation (OT&E)	-	0.000	1.442	-	1.442
Description: Plan, execute and report OT&E for Space Systems					
FY 2021 Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 6	**R-1 Program Element (Number/Name)** PE 1206759SF / *Major T&E Investment - Space*	**Project (Number/Name)** 660191 / *Initial Operational Test and Eval*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Work will be done in PE 65712F. ***FY 2022 Base Plans:*** Continue FY21 activities from PE 65712F namely: -Advanced Extremely High Frequency Satellite Communications (Advanced EHF): Conduct early influence -Evolved Strategic SATCOM (ESS): Conduct early influence -Military GPS User Equipment (GPS MGUE): Conduct OUE 2 -GPS Next Generation Control Segment (GPS OCX): Plan for MOT&E -Long-Range Discrimination Radar (LRDR): Conduct IOT&E -Next-Generation Overhead Persistent Infrared (Next-Gen OPIR): Conduct OA -Protected Tactical Enterprise Service (PTES): Complete MOT&E -Protected Tactical SATCOM (PTS): Plan for EOA -Space Based Infrared System (SBIRS): Conduct early influence -Space C2 (formerly JMS): Complete IOT&E -Weather System Follow-On Microwave (WSF-M): Conduct OA -Conduct other planning and operational testing for new space system programs as the requirement becomes known to USSF. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Increase of $1.5 million due to transfer of AFOTEC operational space test activities to USSF.					
Accomplishments/Planned Programs Subtotals	-	0.000	1.442	-	1.442

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• RDTE 06 0604759F: *Major T&E Investment*	106.663	208.680	135.318	-	135.318	-	-	-	-	-	-
• RDTE 06 0605712F: *Initial Operational Test & Evaluation*	13.793	13.557	12.766	-	12.766	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 6	R-1 Program Element (Number/Name) PE 1206759SF / *Major T&E Investment - Space*	Project (Number/Name) 664597 / *Air Force Test Investments*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
664597: *Air Force Test Investments*	-	0.000	0.000	70.061	0.000	70.061	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 6, PE 1206759SF, project 664597, Space Force Test Investments, is a new start.

A. Mission Description and Budget Item Justification

Space Test Infrastructure refers to the development and integration of technical capabilities to include digital, terrestrial and space-based, in order to deploy a minimum viable level of ability to test and evaluate the capability and survivability of DoD Space systems in a contested environment.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to develop, sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Title: Space Force Test Investments	-	0.000	70.061	0.000	70.061
Description: Space Test Infrastructure development and integration of technical capabilities to include digital, terrestrial and space-based, in order to deploy a minimum viable level of ability to test and evaluate the capability and survivability of DoD Space systems in a contested environment.					
FY 2021 Plans: Provides funding required to establish full spectrum environment to evaluate space system survivability and lethality in a highly contested environment. Leverages initial FY19 investment of $54 million and $36 million FY20 congressional add.					
FY 2022 Base Plans: Continues previous efforts but now in a dedicated program element.					
FY 2022 OCO Plans: N/A					
FY 2021 to FY 2022 Increase/Decrease Statement:					

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 6	**R-1 Program Element (Number/Name)** PE 1206759SF / *Major T&E Investment - Space*	**Project (Number/Name)** 664597 / *Air Force Test Investments*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
N/A					
Accomplishments/Planned Programs Subtotals	-	0.000	70.061	0.000	70.061

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• RDTE 06 0605712F: *Initial Operational Test & Evaluation*	13.793	13.557	12.766	0.000	12.766	-	-	-	-	-	-
• RDTE 06 0604759F: *Major T&E Investment*	34.563	44.975	71.503	0.000	71.503	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 6: *RDT&E Management Support*					R-1 Program Element (Number/Name) PE 1206860SF / *Rocket Systems Launch Program (SPACE)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	17.993	17.769	0.000	17.769	-	-	-	-	-	-
661023: *Rocket System Launch Program (RSLP)*	-	0.000	17.993	17.769	0.000	17.769	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Rocket Systems Launch Program (RSLP) provides responsive space and Research, Development, Test and Evaluation (RDT&E) launch vehicle support to DoD and other government agencies using commercial launch systems and excess ballistic missile assets. The RSLP mission was established by the Secretary of Defense in 1972. The small launch program complements the National Security Space Launch (NSSL) program with multiple options to acquire dedicated spacelift and rideshare services for developmental, demonstration, and small operational space vehicles. It provides mission planning, payload integration, vehicle acquisition, processing, launch operations, booster storage and disposition, aging surveillance, maintenance and logistics support for selected DoD responsive space and RDT&E launches. Costs directly attributable to a specific launch or program (e.g., reliability of flight testing, maintenance of launch vehicle processing infrastructure) are paid by the user (Space Force, Navy, Army, Missile Defense Agency (MDA), Defense Advanced Research Project Agency (DARPA), National Reconnaissance Office (NRO), etc.). RSLP maintains exclusive control of decommissioned Minuteman and Peacekeeper assets used in testing to include refurbishment, transportation and handling, storage, aging surveillance, and launch services. RSLP also funds general research, development, prototyping, integration, and supplemental reliability of flight testing efforts for launch to enhance the reliability of the Minotaur and other fleet vehicles (e.g., updates to the Modular Mechanical Ordnance Destruct System).

The FY 2022 funding request was reduced by 0.385 million to account for availability of prior year execution balances.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, to improve innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Rocket Systems Launch weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206860SF *I Rocket Systems Launch Program (SPACE)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	17.993	21.074	0.000	21.074
Current President's Budget	0.000	17.993	17.769	0.000	17.769
Total Adjustments	0.000	0.000	-3.305	0.000	-3.305
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-3.305	0.000	-3.305

Change Summary Explanation

FY 2022: -$2.700M Reduction for higher USSF higher priorities; -$0.385M to account for prior year balances; -$0.220M Inflation Adjustment

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Storage/Refurbishment/Flight Readiness/Demil	-	15.051	14.827
Description: Storage, refurbishment, inventory control, and demil/disposal of decommissioned Minuteman, Peacekeeper and other missile flight test assets ***FY 2021 Plans:*** Continued storage, refurbishment, inventory control, and demil/disposal of decommissioned Minuteman, Peacekeeper and other missile flight test assets and performed research and development support operations as required. Investigated and developed shipping throughput capacity to maximize opportunity for motor disposal. Continued support activities to include but not limited to sustainment replacement and refurbishment of support equipment, mission support, special studies etc. ***FY 2022 Plans:*** Continue storage, refurbishment, inventory control, and demil/disposal of decommissioned Minuteman, Peacekeeper and other missile flight test assets and perform research and development support operations as required. Investigate and develop shipping throughput capacity to maximize opportunity for motor disposal. Continue support activities to include but not limited to sustainment replacement and refurbishment of support equipment, mission support, special studies etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to an adjustment for inflation.			
Title: Aging Surveillance	-	2.142	2.142

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206860SF *I Rocket Systems Launch Program (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Perform aging surveillance-related activities on stored motors ***FY 2021 Plans:*** Continued performing aging surveillance-related activities on stored motors; continued performing analysis/studies to identify and evaluate potential safety-related issues affecting stored motors; continued program office support and related support activities such as, but not limited to mission support, special studies, etc. ***FY 2022 Plans:*** Continue performing aging surveillance-related activities on stored motors; continue performing analysis/studies to identify and evaluate potential safety-related issues affecting stored motors; continue program office support and related support activities such as, but not limited to mission support, special studies, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A			
Title: Other Launch Support Services ***Description:*** Perform Launch Services Activities ***FY 2021 Plans:*** Continued launch vehicle acquisition, processing, launch services support, mission assurance, reliability of flight and operations to launch RDT&E payloads. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Continue launch vehicle acquisition, processing, launch services support, mission assurance, reliability of flight and operations to launch RDT&E payloads. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A	-	0.800	0.800
Accomplishments/Planned Programs Subtotals	-	17.993	17.769

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206860SF *I Rocket Systems Launch Program (SPACE)*

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 6: *RDT&E Management Support*					R-1 Program Element (Number/Name) PE 1206862SF / *Tactically Responsive Launch*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	15.000	0.000	0.000	0.000	-	-	-	-	-	-
664235: *Tactically Responsive Launch*	-	0.000	15.000	0.000	0.000	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1206862F, Tactically Responsive Launch efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1206862SF, Tactically Responsive Launch from Appropriation 3600, Budget Activity 06 due to the creation of a new Appropriation for Space Force.

Tactically Responsive Launch will demonstrate space launch operations that will enable the DoD space domain and strategic deterrence objectives. It will fund proof-of-concept tactically responsive space launch demonstrations using emerging and extant commercial launch providers with the goal to place or replace military capability on orbit within 24 hours.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, to improve innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Tactically Responsive Launch weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206862SF / *Tactically Responsive Launch*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	15.000	0.000	0.000	0.000
Total Adjustments	0.000	15.000	0.000	0.000	0.000
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	15.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	0.000	0.000	0.000

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 664235: *Tactically Responsive Launch*		
Congressional Add: *Tactically Responsive Launch*	-	15.000
Congressional Add Subtotals for Project: 664235	-	15.000
Congressional Add Totals for all Projects	-	15.000

Change Summary Explanation

FY2021: +15.000M Congressional add for Tactically Responsive Launch program.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021
Congressional Add: Tactically Responsive Launch	-	15.000
FY 2021 Plans: Demonstrate proof-of-concept tactically responsive space launch capabilities using emerging and extant launch providers. Activities may include concept design, studies of commercial capabilities and operations, technical analysis, launch service acquisition, prototyping, rideshare service acquisition, processing, launch services support, mission assurance, operations; and tactics, techniques, and procedures, program office support, etc. for demonstration of responsive launch.		
Congressional Adds Subtotals	-	15.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206862SF / *Tactically Responsive Launch*

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

Utilizing new and existing open competitive launch service contracts, Small Business Innovative Research contracts, and Other Transaction Authority (OTA) Agreements to take advantage of evolving commercial capabilities.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 6: *RDT&E Management Support*					R-1 Program Element (Number/Name) PE 1206864SF / *Space Test Program (STP)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	26.541	20.881	0.000	20.881	-	-	-	-	-	-
662617: *Free-Flyer Spacecraft Missions*	-	0.000	26.541	20.881	0.000	20.881	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Space Test Program (STP) executes the annual DoD Space Experiments Review Board (SERB) process and consolidates requirements from Science and Technology (S&T) community in order to optimize space system missions and achieve maximum benefit of available resources. STP designs and executes missions to maximize launch mass to orbit, combines multiple flight experiments on suitable spacecraft, multiple spacecraft on available launch vehicles, and facilitates launch packages for government, commercial, and international partnerships. STP provides a cost-effective way to evaluate militarily relevant space flight experiments that:

• Demonstrate on orbit performance of new technologies to increase technology readiness level and validate research hypotheses for the S&T community
• Develop and mature future operational capabilities
• Advance operational tactics, techniques and procedures for future space and test capabilities
• Enable on-orbit experiments to support S&T
• Leverage national (e.g. DoD, commercial, and NASA) and international launch opportunities to increase space access for S&T efforts.

STP supports the Space Force efforts to define future system architectures that address emerging threats, enable resilient space capabilities, and employ tactical space operations to ensure freedom of operations in the space domain.

STP adheres to Executive Orders 10521 and 13185, and the requirement from the Office of the Under Secretary of Defense Research and Engineering (OUSD R&E) to support research per DoD Instruction 3210.1, Administration and Support of Basic Research. In addition, the Deputy Secretary of Defense Space Test Program Management & Funding Policy, issued in July 2002, reaffirmed STP as the primary provider of spaceflight for the DoD space research community. The July 2002 policy statement also reaffirmed STP's role as the single manager for all DoD payloads on the International Space Station (ISS).

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

The FY 2022 funding request was reduced by 5.963 million to account for the availability of prior year execution balances.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206864SF / *Space Test Program (STP)*

This program is in Budget Activity 6, RDT&E Management Support because this budget activity includes research, development, test and evaluation efforts and funds to sustain and/or modernize the installations or operations required for general research, development, test and evaluation.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	26.541	27.103	0.000	27.103
Current President's Budget	0.000	26.541	20.881	0.000	20.881
Total Adjustments	0.000	0.000	-6.222	0.000	-6.222
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-6.222	0.000	-6.222

Change Summary Explanation

FY 2022: -$5.963M due to execution

FY 2022: -$0.259M due to inflation adjustments

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Payload Integration	-	19.431	15.889
Description: Integrate payloads onto spaceflight missions on the full spectrum of DoD on-orbit R&D (e.g. space vehicle, free-flyer payloads, hosted payloads, etc.). Includes acquisition of associated spacecraft and integration hardware.			
FY 2021 Plans: Continue payload integration of STP-H7 and STP-H9, and begin design for future ISS missions. Complete satellite integration and testing, launch operations, and payload interface verification for STPSat-6. Continue satellite acquisition and integration of STPSat-7. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.			
FY 2022 Plans: Complete STP-H7 launch integration and installation on the ISS. Continue payload integration of HE-1, and STP-H9, and begin design for STP-H10.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206864SF *I Space Test Program (STP)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue satellite integration and test, technical analysis, and interface verifications for STPSat-7. Initiate studies and planning for STPSat-8 acquisition. Collaborate on technical analysis and payload integration rideshare efforts. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021. Program accomplishments transition from payload integration to launch to on-orbit ops. Each year, these requirements expand and contract within the overall budget as a function of the lifecycle of the programs.			
Title: Launch Vehicle and Launch Services ***Description:*** Purchase launch services, launch vehicles, and launch vehicle to support the full spectrum of DoD on-orbit R&D (e.g. space vehicle, free-flyer payloads, hosted payloads, etc.), enabling spaceflight worthiness and "Do No Harm" certification for Space and Missile Systems Center (SMC) and US Space Force (USSF) HQ. ***FY 2021 Plans:*** Continue to support spaceflight worthiness and "Do No Harm" certification. Execute S-28 small launch initiative of up to 3 launch vehicles. ***FY 2022 Plans:*** Continue to support spaceflight worthiness and "Do No Harm" certification for launch readiness. Execute S-28A & B small launch initiatives and initiate the S-29 small launch planning and technical analysis. Plan and complete technical analysis for commercial rideshare launch of DoD SERB experiments and International Space Access Review Board (ISARB) approved experiments not manifested onto S-28 or planned for manifest onto S-29. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021. Program accomplishments transition from payload integration to launch to on-orbit ops. Each year, these requirements expand and contract within the overall budget as a function of the lifecycle of the programs.	-	5.752	4.395
Title: On Orbit Satellite Operations ***Description:*** Execute first-year operations and operations support for STP-sponsored missions. ***FY 2021 Plans:*** Initiate on orbit operations anomaly support for STPSat-6, and continue on orbit operations for ISS and non-ISS payloads	-	1.358	0.597

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 6: *RDT&E Management Support*	**R-1 Program Element (Number/Name)** PE 1206864SF *I Space Test Program (STP)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
(i.e., Ascent, CIRCE, STP27-VP and Recurve). ***FY 2022 Plans:*** Begin on-orbit operations for H7 and continue on-going operations for ISS payloads and DoD SERB payloads as requested. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021. Program accomplishments transition from payload integration to launch to on orbit ops. Each year, these requirements expand and contract within the overall budget as a function of the lifecycle of the programs.			
Accomplishments/Planned Programs Subtotals	-	26.541	20.881

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1201017SF / *Global Sensor Integrated on Network (GSIN)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	5.597	4.731	0.000	4.731	-	-	-	-	-	-
675368: *GSIN (Global Integrated Sensor Network)*	-	0.000	5.597	4.731	0.000	4.731	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The missions of US Space Command (USSPACECOM) and US Strategic Command (USSTRATCOM) include establishing and providing full-spectrum, global strike, coordinated space and information operations capabilities to meet both deterrent and decisive national security objectives and to provide operational space support, integrated missile defense, Global Command Control, Communications, and Computers Intelligence Surveillance and Reconnaissance (C4ISR), nuclear enterprise, and specialized planning expertise.

The Nation's strategic Command and Control (C2) sensors and mission planning programs cannot rapidly exchange information across multiple missions, creating ambiguity that delays time critical national C2 decision making processes. Global Sensor Integrated on Network (GSIN) developed and established a unified schema that integrates disparate Missile Warning (MW), Missile Defense (MD), Technical Intelligence (TI), Measurement and signature intelligence (MASINT), and a variety of non-traditional data into a single, exposed data set, providing resilient and unambiguous MW/MD data to national leadership. GSIN also enables existing radars and sensors to provide data in net-centric formats consumable by other authorized systems and mission areas, thus reducing the need to acquire more systems. Activities also include studies and analysis to support current program planning, execution, and future program planning.

GSIN directly supports USSPACECOM, USSTRATCOM and other Combatant Commands and Major Commands, and Nuclear Enterprise Center (NEC) mission sets. GSIN meshes together selected systems and sensors (from tactical to strategic), including the Nation's most modern and capable assets, taking advantage of their larger numbers, improved algorithms, mobility, and forward deployment to provide earlier cross-cueing and expanded decision space when every second counts. Repurposing these traditionally stove-piped systems and sensors, GSIN enables the warfighter in several ways. GSIN enables creation of a User-Defined Operating Picture (UDOP) to provide a single, unambiguous missile event picture allowing real-time collaboration for nuclear C2 and improved senior leader situational awareness (SA) for effective decision-making. GSIN also improves Space Domain Awareness (SDA) by accessing additional sensor capability and provides this data for the larger space order of battle capabilities. GSIN dramatically improves the ingestion of non-traditional, but readily available, non-US government and commercial data to the Space Force satellite catalog. GSIN addresses US Northern Command (USNORTHCOM) and USSTRATCOM's signed Joint Emergent Operational Need (JEON) ST-0010 request for uninterrupted traditional and non-traditional sensor data integration and the Global Threat Characterization Assessment (GTCA) Operational Planning Team report. GSIN provides critical and unique data to the USSPACECOM SDA data repositories to facilitate the large Space Battle Management Command and Control (BMC2) suite of capabilities/programs. Finally, GSIN provides Cross Domain Solution (CDS) access, machine learning, data analysis and correlation/fusion functions to optimize situational awareness in the field.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1201017SF / *Global Sensor Integrated on Network (GSIN)*

Global Data Integration (GDI) is the expansion of Global Sensor Integrated on Network (GSIN) and includes DATABAHN, Fusion Engine for All-Source Tracking (FEAST), and Data Integrity efforts. The DATABAHN effort includes developing and fielding a dedicated CDS, including geographically-separated, redundant nodes, to provide greater operational resiliency. DATABAHN will provide for the inclusion of data consumers and providers who require GSIN sensor data. The FEAST effort will replicate Secret Internet Protocol Routed Network (SIPRNET)-level GSIN capability on Joint Worldwide Intelligence Communications System (JWICS), and integrate additional Top Secret/Special Compartmentalized Information (TS/SCI) data sources and algorithms. Finally the Data Integrity effort will provide artificial intelligence (AI) and block-chain technology in support of data governance, provenance and discoverability.

The FY 2022 funding request was reduced by $1.797M to account for the availability of prior year execution balances.

Space Acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver Global Data Integration (GDI) weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0605826SF, 605827SF, 0605828SF, 0605829SF, 0605830SF, 0605831SF, 0605832SF, and 0605898SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	3.708	0.000	0.000	0.000
Current President's Budget	0.000	5.597	4.731	0.000	4.731
Total Adjustments	0.000	1.889	4.731	0.000	4.731
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	1.889			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	4.731	0.000	4.731

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1201017SF / *Global Sensor Integrated on Network (GSIN)*

Change Summary Explanation

FY 2021: Congressional directed transfer of remaining GSIN Air Force funds to Space Force

FY 2022: -$1.839M including -$1.797M reduction to account for the availability of prior year execution balances and -$0.059M reduction to account for inflation

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Global Data Integration (GDI)	-	5.097	4.231

Description: Develop common Extensible Markup Language (XML) net-enabled data schemas and configuration management processes and procedures for Missile Warning, Missile Defense, Space, MASINT/Technical Intelligence, and Sensor data to manage the XML schema and associated XML messaging and services. Develop technical outreach for potential new GSIN data consumers and providers who require GSIN sensor data. Upgrade GSIN capabilities as Defense Information Systems Agency (DISA) Enterprise Services evolve. Continue modifications to data services. Support integration of GSIN sensor data into appropriate registries/catalogs. Continue development of GSIN data services to enable visualization in a common operating picture. Conduct studies and demonstrations of SSA capabilities, data correlation, and assessment services for risk reduction evaluations.

The DATABAHN effort will develop and field a dedicated CDS, including geographically-separated, redundant nodes, providing greater operational resiliency. DATABAHN will provide for the inclusion of data consumers and providers who require GSIN sensor data. DATABAHN will support integration of GSIN sensor data into appropriate registries/catalogs. DATABAHN will continue development of GSIN data services to enable visualization in a common operating picture.

The Fusion Engine for All-Source Tracking (FEAST) effort will replicate Secret Internet Protocol Routed Network (SIPRNET)-level FEAST capability on Joint Worldwide Intelligence Communications System (JWICS), and integrate additional Top Secret/Special Compartmentalized Information (TS/SCI) data sources and algorithms.

Data Integrity provides artificial intelligence (AI) and block-chain technology in support of data governance, provenance and discoverability.

The additional funding for these efforts is required to support rapid implementation of system resiliency and situational awareness capabilities required to operate in the contested space domain supporting both USSPACECOM and USSTRATCOM missions.

FY 2021 Plans:

- DATABAHN: Begin development, deployment, accreditation and certification of Mountain Pass PL-5 cross-domain solution (CDS)
- FEAST: Replicate SIPRNET instantiation of FEAST on JWICS
- FEAST: Initiate integration and testing of additional TS/SCI data sources

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1201017SF *I Global Sensor Integrated on Network (GSIN)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Data Integrity: Develop GSIN Next to leverage Block Chain and Artificial Intelligence technologies and provide metadata of data type, data attributes and data limitation ***FY 2022 Plans:*** - DATABAHN: Continue accreditation and certification of Mountain Pass site one and begin replication of Mountain Pass to site two - FEAST: Finalize integration and testing of TS/SCI data sources - Data Integrity: Continue AI development activities, testing and evaluation - Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to the development and fielding of a new, resilient, and dedicated Cross-Domain Solution under the DATABAHN effort, as well as the integration and testing of TS/SCI data sources into the JWICS instantiation of GDI under the FEAST effort.			
Title: Radar, Sensor, Technical Intelligence (TI), and Allied Systems ***Description:*** Radar, sensor, technical intelligence and Allied Systems: Designs, develops, exposes and integrates data from radar, sensors and technical intelligence systems in regions of the world where potential GSIN users currently do not have coverage. Provide real time data from systems that previously reported in hours or days after critical events. Conduct studies/ surveys/meetings as necessary to continually identify systems meeting GSIN user data exposure needs. Designs, develops, tests, exposes, and integrates SDA data from previously untapped systems into space production systems and the Global Information Grid (GIG). Develop implementation plans to mature data exposure capabilities. ***FY 2021 Plans:*** - Continue Integration and Testing of Radar 1 - Begin Design/Development of Radar 2 - Production/Fielding of Radar 2 ***FY 2022 Plans:*** - Complete Integration and Testing of Radar 1 - Continue Production/Fielding of Radar 2	-	0.500	0.500

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1201017SF *I Global Sensor Integrated on Network (GSIN)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Rapidly implement system resiliency and situational awareness changes required to operate in the contested space domain. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A			
Accomplishments/Planned Programs Subtotals	-	5.597	4.731

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

GSIN predominantly uses existing government contract vehicles, from agencies such as Missile Defense Agency (MDA) or Air Force Life Cycle Management Center (AFLCMC) to develop and modernize the combined SDA/MW/MD/MASINT/TI data exposure architecture and solution. The contracts are managed by the relevant organization's contracting office. The Space and Missile Systems Center (SMC) provides overall program and financial management and other support for GSIN.

Massachusetts Institute of Technology/Lincoln Labs (MIT/LL) will provide the Data Integrity effort based upon ongoing research as an FFRDC.

All contracts are competed whenever possible.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1201017SF / *Global Sensor Integrated on Network (GSIN)*	Project (Number/Name) 675368 / *GSIN (Global Integrated Sensor Network)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Data Services, Net Centric Integration and Configuration Control, and Program Outreach DATABAHN	TBD	TBD : TBD	-	-		4.195	Jun 2021	2.519	May 2022	-		2.519	-	-	-
Data Services, Net Centric Integration and Configuration Control, and Program Outreach FEAST	C/CPFF	SciTech : Boulder, CO	-	-		0.359	Sep 2021	1.212	Dec 2021	-		1.212	-	-	-
Data Services, Net Centric Integration and Configuration Control, and Program Outreach Data Integrity	RO	MIT/LL : Boston, MA	-	-		0.543	Jan 2021	0.500	Jan 2022	-		0.500	-	-	-
Radar, Sensor, Technical Intelligence (TI), and Allied Systems	C/CPAF	Raytheon : Colorado Springs, CO	-	-		0.500	Mar 2021	0.500	Mar 2022	-		0.500	-	-	-
		Subtotal	-	-		5.597		4.731		-		4.731	-	-	N/A

Remarks

FY 2022 funding incrementally funds existing contracts for GSIN/GDI efforts.

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		5.597		4.731		-		4.731	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1201017SF / *Global Sensor Integrated on Network (GSIN)*	**Project (Number/Name)** 675368 / *GSIN (Global Integrated Sensor Network)*

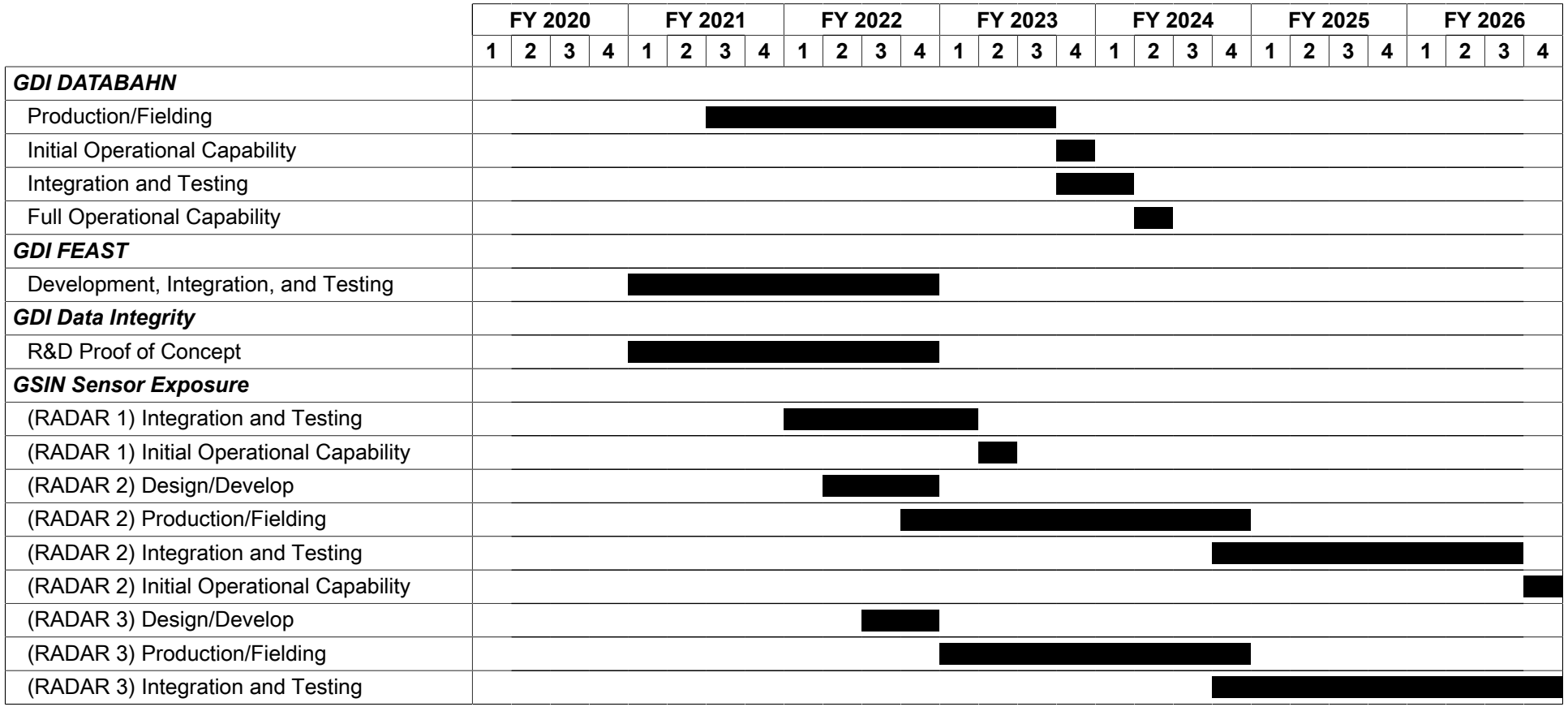

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1201017SF / *Global Sensor Integrated on Network (GSIN)*	**Project (Number/Name)** 675368 / *GSIN (Global Integrated Sensor Network)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GDI DATABAHN				
Production/Fielding	3	2021	3	2023
Initial Operational Capability	4	2023	4	2023
Integration and Testing	4	2023	1	2024
Full Operational Capability	2	2024	2	2024
GDI FEAST				
Development, Integration, and Testing	1	2021	4	2022
GDI Data Integrity				
R&D Proof of Concept	1	2021	4	2022
GSIN Sensor Exposure				
(RADAR 1) Integration and Testing	1	2022	1	2023
(RADAR 1) Initial Operational Capability	2	2023	2	2023
(RADAR 2) Design/Develop	2	2022	4	2022
(RADAR 2) Production/Fielding	4	2022	4	2024
(RADAR 2) Integration and Testing	4	2024	3	2026
(RADAR 2) Initial Operational Capability	4	2026	4	2026
(RADAR 3) Design/Develop	3	2022	4	2022
(RADAR 3) Production/Fielding	1	2023	4	2024
(RADAR 3) Integration and Testing	4	2024	4	2026

Note

All RADAR timelines are notional, pending FMS actions.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203001SF *I Family of Advanced BLoS Terminals (FAB-T)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	232.229	156.788	0.000	156.788	-	-	-	-	-	-
672490: *Family of Advanced Beyond Line-of-Sight Terminals (FAB-T)*	-	0.000	18.294	14.817	0.000	14.817	-	-	-	-	-	-
673035: *Presidential and National Voice Conferencing*	-	0.000	57.199	42.992	0.000	42.992	-	-	-	-	-	-
673040: *Force Element Terminal*	-	0.000	156.736	98.979	0.000	98.979	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Family of Advanced Beyond Line-of-Sight Terminals (FAB-T) - Command Post Terminal (CPT), Force Element Terminal (FET), and Presidential and National Voice Conferencing (PNVC) Integrator programs - transitioned from AFPEO/SP to AFPEO/NC effective December 2018.

The FAB-T CPT project replaces legacy Milstar terminals and will provide Extremely High Frequency (EHF), protected, high data rate communication for nuclear and conventional forces to include PNVC. FAB-T will provide the new, highly secure, state-of-the-art capability for DoD platforms to include strategic platforms and airborne/ ground command posts via Milstar, and AEHF Satellites. FAB-T CPT terminals will also support the critical command and control (C2) of the Milstar and AEHF satellite constellations.

The FET project provides secure, protected, and survivable communications for the strategic warfighter through airborne-based MILSATCOM terminals. The FET will provide the B-52 aircraft with worldwide nuclear and non-nuclear, survivable, anti-jam Low Probability of Detect (LPD)/ Low Probability of Intercept (LPI) data and voice communications. The FET will be interoperable with AEHF, Enhanced Polar Systems - Recapitalization (EPS-R), and Evolved Strategic SATCOM (ESS) satellite constellations utilizing Extended Data Rate (XDR) waveforms. FET was designated as MTA (Middle Tier Acquisition) in Feb 2019.

The FY 2022 funding request was reduced by 31.863 million to account for the availability of prior year execution balances.

The PNVC Integrator capability is a critical element of the Nuclear Command, Control, and Communications (NC3) System. PNVC is the Survivable Emergency Conferencing Network (SECN) replacement capability which provides anti-jam, anti-scintillation, survivable, and endurable voice communications through the AEHF satellite system for national and strategic users. There are several components being developed and procured by other organizations that must be synchronized to expeditiously field the capability. The PNVC Integrator is responsible for end-to-end integration of these components, to include requirements traceability, end-to-end system testing, configuration and checkout activities, training and technical manuals, network transition support, identification of deficiencies in overall PNVC system capability, enterprise, and life cycle support for PNVC components. The AFPEO/SP approved entry into the acquisition lifecycle as a post MS-A ACAT III Program of Record in January 2016. Starting in December 2018 PNVC Integrator is responsible the requests for funding of all program elements related to the Defense Information Systems and Agency (DISA) components of the PNVC System in accordance with FY 2018 National Defense Authorization Act, Sec. 1661.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203001SF *I Family of Advanced BLoS Terminals (FAB-T)*

In February 2019, the AFPEO/NC declared the PNVC Integrator an ACAT II Program based on the inclusion of DISA funding in the program budget.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver FAB-T weapon system capability. The use of such programs funds would be in addition to the civilian pay expenses budgeted in program element 0605831F.In FY20 $0.380M and in FY21 $0.530M was expended for civilian pay expenses in this program element.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	247.229	190.594	0.000	190.594
Current President's Budget	0.000	232.229	156.788	0.000	156.788
Total Adjustments	0.000	-15.000	-33.806	0.000	-33.806
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-15.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-33.806	0.000	-33.806

Change Summary Explanation

FY 2021: -15.00M reduction for Congressional Mark

FY 2022: -31.863M to account for the availability of prior year execution balances. - 1.943M due to inflation Adjustment

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	Project (Number/Name) 672490 / *Family of Advanced Beyond Line-of-Sight Terminals (FAB-T)*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
672490: *Family of Advanced Beyond Line-of-Sight Terminals (FAB-T)*	-	0.000	18.294	14.817	0.000	14.817	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The FAB-T program replaces legacy Milstar terminals and will provide Extremely High Frequency (EHF), protected high data rate communication for nuclear and conventional forces to include Presidential and National Voice Conferencing (PNVC). FAB-T will provide this new, highly secure, state-of-the-art capability for DoD platforms to include strategic platforms and airborne/ground command posts via Milstar, AEHF, and Enhanced Polar System (EPS) satellites. FAB-T terminals will also support the critical command and control (C2) of the Milstar, AEHF and EPS satellite constellations. The Department of the Air Force (DAF) will continue development of the FAB-T Command Post Terminal (CPT), performing systems engineering, architecture studies, development & operational test efforts, FAB-T terminal interoperability with the full AEHF satellite constellation activities, and other program activities to meet current and future emerging SATCOM requirements.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: FAB-T CPT Development	-	18.294	14.817
Description: The FAB-T program will provide EHF voice and data MILSATCOM for nuclear and conventional forces as well as airborne and ground command posts with connectivity to Milstar, AEHF, and EPS satellites. ***FY 2021 Plans:*** The FAB-T program will continue to provide EHF voice and data MILSATCOM for nuclear and conventional forces as well as airborne and ground command posts with connectivity to Milstar, AEHF, and EPS satellites. Additional development will be for National Security Agency (NSA) AEHF terminal certification. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2022 Plans:*** The FAB-T program will continue to provide EHF voice and data MILSATCOM for nuclear and conventional forces as well as airborne and ground command posts with connectivity to Milstar, AEHF, and EPS satellites. Continued development of efforts required for National Security Agency (NSA) AEHF terminal certification, specifically an update to the software encryption station. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 672490 / *Family of Advanced Beyond Line-of-Sight Terminals (FAB-T)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The Nuclear Command, Control, and Communication (NC3) system of systems provides connectivity from the President or Secretary of Defense through the National Military Command System (NMCS) to nuclear execution forces worldwide. To enhance and maintain NC3 mission success, the AF formalized AF NC3 elements as a specified AF Weapon System (WS), AN/USQ-225. Activities funded in this Program pay for its integration into multiple legacy systems, other ongoing NC3 acquisition programs, and future capabilities for the overall AF NC3 WS. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The reduction in resource requirements stems from a shift from design and development to testing of efforts in support of NSA AEHF terminal certification.			
Accomplishments/Planned Programs Subtotals	-	18.294	14.817

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPAF 01 FBLOST FAB-T: *FAB-T*	22.105	55.950	33.645	0.000	33.645	-	-	-	-	-	-
• SPAF 01 FBLOST PNVC: *FAB-T*	1.915	5.240	5.799	0.000	5.799	-	-	-	-	-	-
• SPAF 01 SPAF FET: *FAB-T*	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-
• RDTE 07 FET: *FAB-T*	113.377	156.736	98.979	0.000	98.979	-	-	-	-	-	-
• RDTE 07 PNVC: *FAB-T*	65.911	57.199	42.992	0.000	42.992	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

FAB-T Acquisition Strategy: In FY 2012, the government restructured the FAB-T development program to introduce competition into the acquisition strategy in order to reduce risk in delivering this capability as well as to drive down production costs. To ensure the best value to the government, the DAF awarded production contracts in September 2013 to both contractors (Boeing and Raytheon). The production contracts began with production planning for both contractors. In June 2014, the DAF down-selected to Raytheon. Development and production of FAB-T Command Post Terminals continued with Raytheon. The first Production contract options to produce CPT terminals were exercised after a successful Milestone C decision was approved September 1, 2015.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	Project (Number/Name) 672490 / *Family of Advanced Beyond Line-of-Sight Terminals (FAB-T)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FAB-T CPT Prime Contract	Various	Raytheon : Marlboro, MA	-	-		17.346	Jan 2021	13.862	Nov 2021	-		13.862	-	-	-
FAB-T CPT Technical Mission Analysis	Various	TBD : MA	-	-		0.000	Oct 2020	0.397	Dec 2021	-		0.397	-	-	-
FAB-T CPT GFE	Various	TBD : TBD, MA	-	-		0.002	Feb 2021	-		-		-	-	-	-
		Subtotal	-	-		17.348		14.259		-		14.259	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FAB-T CPT Other Support	Various	Various : Various, MA	-	-		0.946	Dec 2020	0.142	Oct 2021	-		0.142	-	-	-
FAB-T CPT A&AS	Various	Various : Various, MA	-	-		-		0.416	Feb 2022	-		0.416	-	-	-
		Subtotal	-	-		0.946		0.558		-		0.558	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		18.294		14.817		-		14.817	-	-	N/A

Remarks

Prior Years funding, FY 2016/FY 2017 $95.229M was executed in Program Element (PE) 0303001F. Prior to FY 2016, $180.602M was executed in PE 0303601F.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 672490 / *Family of Advanced Beyond Line-of-Sight Terminals (FAB-T)*

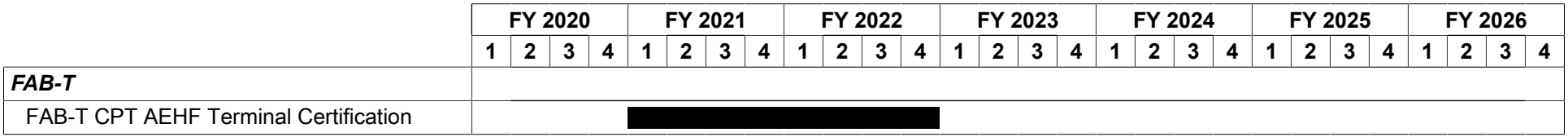

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 672490 / *Family of Advanced Beyond Line-of-Sight Terminals (FAB-T)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
FAB-T				
FAB-T CPT AEHF Terminal Certification	1	2021	4	2022

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	Project (Number/Name) 673035 / *Presidential and National Voice Conferencing*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
673035: *Presidential and National Voice Conferencing*	-	0.000	57.199	42.992	0.000	42.992	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The PNVC capability is a critical element of the Nuclear Command, Control, and Communications (NC3) System. PNVC is the Survivable Emergency Conferencing Network (SECN) replacement capability which provides anti-jam, anti-scintillation, survivable, and endurable voice communications through the AEHF satellite system for national and strategic users. There are several components being developed and procured by other organizations that must be synchronized to expeditiously field this capability. The PNVC Integrator is responsible for end-to-end integration of these components, to include requirements traceability, end-to-end system testing, configuration and checkout activities, training and technical manuals, network transition support, identification of deficiencies in overall PNVC system capability, enterprise and life cycle support for PNVC components. The AFPEO/SP approved entry into the acquisition lifecycle as a post MS-A ACAT III Program of Record in January 2016. In February 2019 the AF PEO/NC declared the PNVC Integrator an ACAT II Program based on updated approved budget request.

Starting in December 2018, PNVC Integrator is responsible for all program elements' requests for funding related to the Defense Information Systems Agency (DISA) components of the PNVC System in accordance with FY 2018 National Defense Authorization Act, Sec. 1661.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: PNVC Integrator	-	57.199	42.992
Description: PNVC is the SECN replacement capability which provides anti-jam, anti-scintillation, survivable, and endurable voice communications through the AEHF satellite system for national and strategic users. The PNVC capability consists of constituent programs being developed and produced by other organizations. This program will integrate test and support configuration of hardware from these other programs. PNVC components will be installed at ground fixed and mobile command locations as well as three aircraft platforms.			
FY 2021 Plans: PNVC Integrator government team will conduct Phase 2 Developmental Test for the remaining operational nodes and end-to-end system test with support from the integrator contractor. In parallel, the integrator contractor and component contractors will continue to resolve any hardware and software deficiencies identified during test, conduct regression and interoperability testing using both contractor and government test laboratories, and conduct planning for future planned system upgrades. The PNVC Integrator will also conduct integration and checkout activities and training at remaining operational sites world-wide, conduct cybersecurity testing, and continue to work closely with sustainment organizations on the preparations for transition to depot support.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 673035 / *Presidential and National Voice Conferencing*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
PNVC Integrator activities will include but are not limited to program office support, studies, technical analysis, prototyping, test planning and execution, deficiency resolution, logistics and sustainment support planning, component product support, risk reduction activities, technical analysis and studies, platform integration support, and integration laboratory support. ***FY 2022 Plans:*** PNVC Integrator team will conduct Multi-Service Operational Test and Evaluation (MOT&E), led by the Air Force Operational Test and Evaluation Center (AFOTEC), and overseen by the Director, Operational Test & Evaluation (DOT&E). This end-to-end system test will assess all nodes types in the PNVC system in its operational environment to determine PNVC's overall capability to support mission accomplishment, as determined by effectiveness, suitability, and other applicable operational considerations such as survivability. The PNVC Integrator will also conduct integration and checkout activities and training at remaining operational sites world-wide, conduct cyber-security testing, and continue to work closely with the applicable sustainment organizations, as they make their preparations for becoming responsible for PNVC sustainment, engineering, and maintenance. PNVC Integrator activities will include, but are not limited to program office support, prototyping, test planning and execution, deficiency resolution, logistics and sustainment support planning, component product support, risk reduction activities, technical analysis and studies, platform integration and support, and integration of laboratory support. The Nuclear Command, Control, and Communication (NC3) system of systems provides connectivity from the President or Secretary of Defense through the National Military Command System (NMCS) to nuclear execution forces worldwide. To enhance and maintain NC3 mission success, the AF formalized AF NC3 elements as a specified AF Weapon System (WS), AN/USQ-225. Activities funded in this Program pay for its integration into multiple legacy systems, other ongoing NC3 acquisition programs, and future capabilities for the overall AF NC3 WS. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** As the PNVC system nears its operational capability, the government's role as the integrator is decreasing, and the associated requirements for support from the contractor will likewise decline.			
Accomplishments/Planned Programs Subtotals	-	57.199	42.992

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 673035 / *Presidential and National Voice Conferencing*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPAF 01 FBLOST FAB-T: *FAB-T*	22.105	55.950	33.645	0.000	33.645	-	-	-	-	-	-
• SPAF 01 FBLOST PNVC: *FAB-T*	1.915	5.240	5.799	0.000	5.799	-	-	-	-	-	-
• SPAF 01 SPAF FET: *FAB-T*	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-
• RDTE 07 FET: *FAB-T*	113.377	156.736	98.979	0.000	98.979	-	-	-	-	-	-
• RDTE 07 FAB-T CPT: *FAB-T*	16.000	18.294	14.817	0.000	14.817	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

PNVC Acquisition Strategy: On May 15, 2015 the Deputy Secretary of Defense assigned the PNVC End-to-End Integration responsibility to the DAF; effective May 16, 2015, SAF/AQ designated the AFPEO/SP. In February 2019 the AF PEO/NC declared the PNVC Integrator an ACAT II Program based on updated approved budget request. The PNVC End-to-End Integrator program is responsible for requirements traceability, End-to-End system testing, site configuration activities, training and technical manuals, network transition support, identifying deficiencies in the PNVC capability, and enterprise and life cycle support for all PNVC components. Starting in December 2018 PNVC Integration is responsible for all program elements' requests for funding related to the Defense Information Systems and Agency (DISA) components of the PNVC System in accordance with FY 2018 National Defense Authorization Act, Sec. 1661.

PNVC will continue to support component fielding, conduct site integration and checkout, and prepare for and execute integrated developmental test activities in advance of the PNVC system Initial Operating Capability.

Beginning in FY2020, all PNVC funds were transferred from DISA to Project 673035, for execution.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 673035 / *Presidential and National Voice Conferencing*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PNVC Prime Contract	Various	Raytheon : Largo, FL	-	-		36.811	Oct 2020	28.480	Oct 2021	-		28.480	-	-	-
PNVC Technical Mission Analysis	Various	Various : Various, MA	-	-		3.462	Oct 2020	3.089	Oct 2021	-		3.089	-	-	-
PNVC Enterprise SE&I	Various	Various : Various, MA	-	-		4.125	Oct 2020	3.305	Oct 2021	-		3.305	-	-	-
		Subtotal	-	-		44.398		34.874		-		34.874	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PNVC Government Test and LDTO Support	Various	Various : Various, MA	-	-		2.756	Oct 2020	0.687	Oct 2021	-		0.687	-	-	-
		Subtotal	-	-		2.756		0.687		-		0.687	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
PNVC FFRDC	MIPR	Various : Various, MA	-	-		3.964	Oct 2020	3.680	Oct 2021	-		3.680	-	-	-
PNVC A&AS	Various	Various : Various, MA	-	-		2.191	Oct 2020	2.162	Nov 2021	-		2.162	-	-	-
PNVC Other Support	Various	Various : Various, MA	-	-		3.890	Oct 2020	1.589	Oct 2021	-		1.589	-	-	-
		Subtotal	-	-		10.045		7.431		-		7.431	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		57.199		42.992		-		42.992	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	Project (Number/Name) 673035 / *Presidential and National Voice Conferencing*	

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 673035 / *Presidential and National Voice Conferencing*

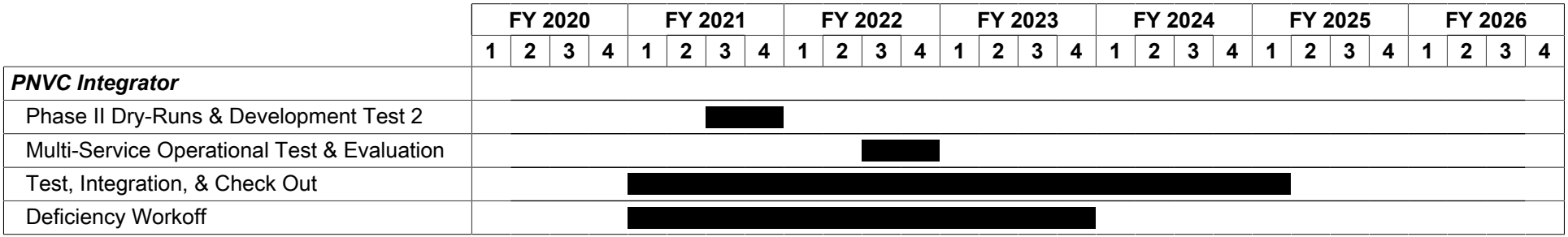

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 673035 / *Presidential and National Voice Conferencing*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
PNVC Integrator				
Phase II Dry-Runs & Development Test 2	3	2021	4	2021
Multi-Service Operational Test & Evaluation	3	2022	4	2022
Test, Integration, & Check Out	1	2021	1	2025
Deficiency Workoff	1	2021	4	2023

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	Project (Number/Name) 673040 / *Force Element Terminal*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
673040: *Force Element Terminal*	-	0.000	156.736	98.979	0.000	98.979	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Force Element Terminal (FET) program provides secure, protected, and survivable communications for the strategic warfighter through airborne based MILSATCOM terminals. The FET will provide the B-52 aircraft with worldwide nuclear and non-nuclear survivable, anti-jam, Low Probability of Detect (LPD)/Low Probability of Intercept (LPI), data and voice communications. The FET will be interoperable with AEHF, Enhanced Polar Systems - Recapitalization (EPS-R), and Evolved Strategic SATCOM (ESS) Satellite constellations utilizing Extended Data Rate (XDR) waveforms.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: FAB-T FET	-	156.736	98.979
Description: Description: Continue development of Force Element Terminals. Development activities include, but are not limited to, FET design, development and qualification testing.			
FY 2021 Plans: Funding is for the continued development of Force Element Terminals. Design activities will include, but not limited to, the conduct of design reviews including a Critical Design Review. FET development activities will include nuclear hardness parts analysis and testing, performance of reliability growth testing, fabrication of prototypes and test assets to support terminal environmental and functional qualification and flight testing. Planning and support activities will continue qualification test planning, logistics support planning, risk reduction activities, technical analysis and studies, platform integration support, and program office support. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc.			
FY 2022 Plans: Funding is for the continued development of Force Element Terminals. FET integration and testing activities will include reliability growth testing and fabrication of test assets; prototypes will support terminal environmental and functional qualification and flight testing. Planning and support activities will continue qualification test planning, logistics support planning, risk reduction activities, technical analysis and studies, platform integration support, and program office support.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 673040 / *Force Element Terminal*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
The Nuclear Command, Control, and Communication (NC3) system of systems provides connectivity from the President or Secretary of Defense through the National Military Command System (NMCS) to nuclear execution forces worldwide. To enhance and maintain NC3 mission success, the AF formalized AF NC3 elements as a specified AF Weapon System (WS), AN/USQ-225. Activities funded in this Program pay for its integration into multiple legacy systems, other ongoing NC3 acquisition programs, and future capabilities for the overall AF NC3 WS. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The reduction in resource requirements stems from the FET development transition from design planning and prototype development to integration and testing of the prototypes and test assets.			
Accomplishments/Planned Programs Subtotals	-	156.736	98.979

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPAF 01 FBLOST FAB-T: *FAB-T*	22.105	55.950	33.645	0.000	33.645	-	-	-	-	-	-
• SPAF 01 FBLOST PNVC: *FAB-T*	1.915	5.240	5.799	0.000	5.799	-	-	-	-	-	-
• SPAF 01 SPAF FET: *FAB-T*	0.000	0.000	0.000	0.000	0.000	-	-	-	-	-	-
• RDTE 07 PNVC: *FAB-T*	65.911	57.199	43.525	0.000	43.525	-	-	-	-	-	-
• RDTE 07 FAB-T CPT: *FAB-T*	15.502	18.294	14.817	0.000	14.817	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

FET Acquisition Strategy: Per the Acquisition Strategy Panel briefed to SAF/AQ on February 7, 2019, FET is pursuing a Rapid Prototyping development Section 804 approach of the National Defense Authorization Act for FY 2016 (Public Law 114-92). This Rapid Prototyping program enables FET to accelerate the nominal program development timeline in support of the accelerated USSTRATCOM-requested Initial Operating Capability. FET awarded a development effort in FY 2020 leading to a rapid production decision in FY 2023. The rapid Prototyping effort enables FET to develop, install, and obtain operationally-representative test data from early B-52 FET prototypes which will also have residual operations capability. The overall development effort includes system design and build of sufficient test assets to allow for expeditious development, testing, qualification and integration support of the FET capability. FET will meet B-52 platform requirements to support USSTRATCOM's Strategic Nuclear Command Control and Communication (NC3) mission.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	Project (Number/Name) 673040 / *Force Element Terminal*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FAB-T FET Development Contracts	Various	Raytheon : Marlborough, MA	-	-		127.088	Oct 2020	74.111	Nov 2021	-		74.111	-	-	-
FAB-T FET Technical Mission Analysis	Various	TBD : TBD, MA	-	-		2.482	Oct 2020	1.625	Nov 2021	-		1.625	-	-	-
FAB-T FET Enterprise SE&I	Various	Not specified. : TBD	-	-		0.357	Mar 2021	0.000	Nov 2021	-		0.000	-	-	-
		Subtotal	-	-		129.927		75.736		-		75.736	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FAB-T FET Test & Evaluation and Assets	PO	Multiple Agencies : TBD	-	-		11.593	Dec 2020	6.882	Nov 2021	-		6.882	-	-	-
		Subtotal	-	-		11.593		6.882		-		6.882	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FAB-T FET FFRDC	Various	Various : Various, MA	-	-		4.801	Dec 2020	6.005	Nov 2021	-		6.005	-	-	-
FAB-T FET Other Support	Various	Various : Various, MA	-	-		6.394	Nov 2020	7.324	Nov 2021	-		7.324	-	-	-
FAB-T FET A&AS	Various	Various : Various, MA	-	-		4.021	Dec 2020	3.032	Dec 2021	-		3.032	-	-	-
		Subtotal	-	-		15.216		16.361		-		16.361	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		156.736		98.979		-		98.979	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	Project (Number/Name) 673040 / *Force Element Terminal*	

	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 673040 / *Force Element Terminal*

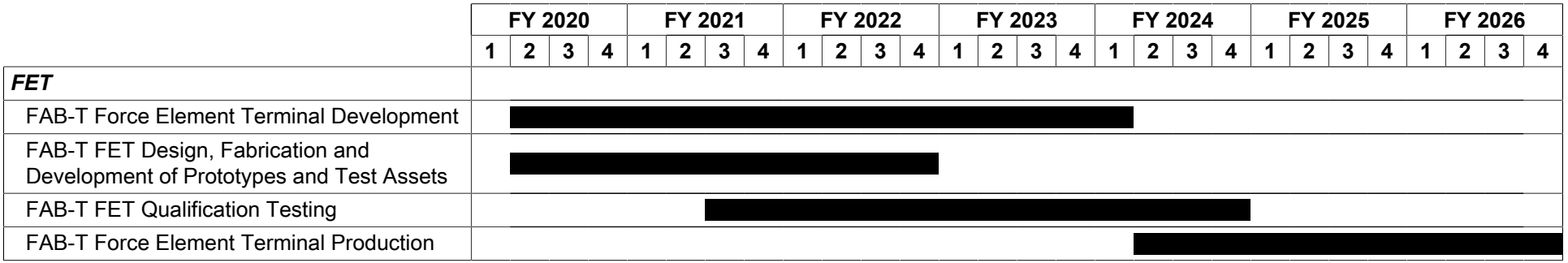

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203001SF / *Family of Advanced BLoS Terminals (FAB-T)*	**Project (Number/Name)** 673040 / *Force Element Terminal*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
FET				
FAB-T Force Element Terminal Development	2	2020	1	2024
FAB-T FET Design, Fabrication and Development of Prototypes and Test Assets	2	2020	4	2022
FAB-T FET Qualification Testing	3	2021	4	2024
FAB-T Force Element Terminal Production	2	2024	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203040SF / *DCO-Space*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	0.000	2.150	0.000	2.150	-	-	-	-	-	-
673070: *Defensive Cyber Ops - Space*	-	0.000	0.000	2.150	0.000	2.150	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2022, PE 1203040SF, Defense Cyber Operations - Space efforts were transferred from PE 1203110SF Satellite Control Network (SPACE), Budget Activity 07 due to the creation of a new Appropriation for Space Force and Program Element for Defense Cyber Operations - Space. This is not a new start.

Defensive Cyberspace Operations (DCO-S) provides defensive cyber capabilities that protect the network enclaves of USSF mission systems, to include their associated computer systems, software applications and sensitive operational information against unauthorized intrusion, corruption, and/or destruction. The emphasis of the program is directed toward defensive cyberspace capabilities, computer and network systems security, damage assessment and recovery, cyber threat recognition, attribution, and mitigation, and active response methodologies in response to evolving threats and changes to cyber environment. These areas of emphasis are realized through research and development, test and acquisition in the areas of proactive defense, defensive counter cyberspace, cyberspace intelligence, surveillance and reconnaissance, command and control situational awareness, persistent network operations, as well as decision support, recovery, and digital forensics.

These efforts implement a combined Development/Security/Operations (DEVSECOPS) framework which incorporates methodologies, technologies, and tools to deeply embed security best practices into the modern development workflow and tool-chain. This effort will institute four product lines: Detect, Protect, Identify, and Respond. The DCO-S capabilities are developed and deployed as an agile program, leveraging a DEVSECOPS framework to facilitate rapid and timely fielding to operations.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program /project priorities according to an integrated unclassified /classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or re-purpose capabilities.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203040SF / *DCO-Space*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	2.150	0.000	2.150
Total Adjustments	0.000	0.000	2.150	0.000	2.150
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	2.150	0.000	2.150

Change Summary Explanation

FY 2022: +$2.157M; funds transferred to PE 1203040SF; Defense Cyber Operations - Space.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Defensive Cyberspace Operations - Space (DCO-S)	0.000	0.000	2.150

Description: Funding supports cyber hardening and Defensive Cyberspace Operations for Space (DCO-S) activities for the space enterprise. Provides space enterprise defensive cyber solutions to counter advanced persistence cyber threats, through rapid fielding of operational prototypes using agile development methods.

FY 2021 Plans:

DCO-S plans for FY 2021 are in the Air Force Satellite Control Network PE 1203110SF

FY 2022 Plans:

Continue to develop and integrate Detect, Protect, Identify, and Respond product lines of the DCO-S tool suite. Enhance DoD Big Data Platform integrated support. Identify and Detect product lines will explore machine learning tools to que, sort and classify threats and attacks. Respond product line will further develop incident management, forensics, and tailored response tools. DCO-S will continue to fill cyber deficiencies across the space enterprise and enable the Joint All-Domain Command and Control in a future conflict.

Continue to plan and deploy DCO-S product line capabilities to the following mission sets: Protected Communications, Integrated Tactical Warning and Attack Assessment (ITW/AA), and Command and Control Satellite Operations (C2 Sat Ops), Space Domain Awareness (SDA), Precision Navigation and Timing (PNT), Launch, and Nuclear Command Control and Communications (NC3). Continue to rapidly implement system resiliency and situational awareness necessary to operate in the contested space domain.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203040SF / *DCO-Space*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
DCO-S will explore cyber defense technologies that will protect infused sensor and artificially intelligent systems, as part of the Joint All Domain Command Control initiative. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A			
Accomplishments/Planned Programs Subtotals	0.000	0.000	2.150

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

Currently DCO-S is an investment activity to enable the Space Force to develop cyber threat-resistant enterprise architecture and certifications. This activity has potential to inform and support a future Acquisition Strategy decision for a future Software Acquisition or tailored Acquisition Category (ACA T) program for a comprehensive DCO-S Program of Record. The latest DCO-S acquisition strategy approved 28 February 2020, committed to using Other Transaction Authority contract vehicles for fast, agile and adaptable approaches in order to successfully develop defensive cyber applications and deploy them to the space enterprise and next gen systems. We plan to leverage new prototyping techniques, previous Government investments in Federally Funded Research and Development Center (FFRDC) and efforts from Government labs as part of those development activities. This meets the highly dynamic cyber domain, with rapidly adapting adversaries, and shifting priorities, in which the PMO operates. DCO-S is determined to equip the space enterprise with cyber services that increase mission system cyber resiliency, agility, and defense in support of the mission and warfighters. Defensive Cyber Operations is an immediate need to negate the realized threat on space systems today.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203040SF / *DCO-Space*	Project (Number/Name) 673070 / *Defensive Cyber Ops - Space*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
DCO-S Product Line Integration	Various	Various : Colorado Springs, CO : TBD : TBD	-	-		-		2.150	May 2022	-		2.150	-	-	-
		Subtotal	-	-		-		2.150		-		2.150	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		2.150		-		2.150	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203040SF / *DCO-Space*	**Project (Number/Name)** 673070 / *Defensive Cyber Ops - Space*

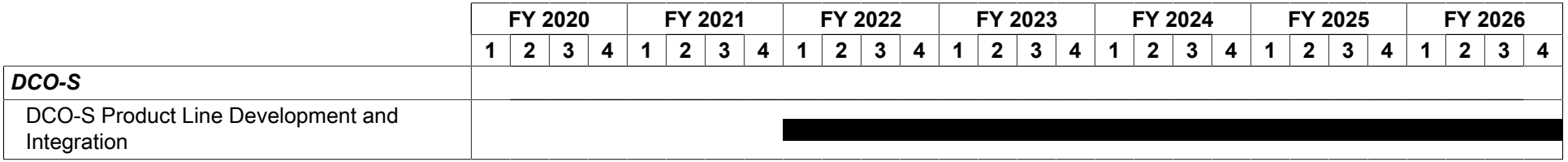

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203040SF / *DCO-Space*	**Project (Number/Name)** 673070 / *Defensive Cyber Ops - Space*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
DCO-S				
DCO-S Product Line Development and Integration	1	2022	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203109SF / *Narrowband Satellite Communications*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	0.000	112.012	0.000	112.012	-	-	-	-	-	-
673109: *SATCOM MUOS*	0.000	0.000	0.000	112.012	0.000	112.012	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Program MDAP/MAIS Code: 345												

Note

This program, BA 7, PE 1203109SF, project 673109, Mobile User Objective System (MUOS) Baseline, is a new start.
This program, BA 7, PE 1203109SF, project 673109, Mobile User Objective System (MUOS) Service Life Extension (SLE), is a new start.
This program, BA 7, PE 1203109SF, project 673109, Narrowband Analysis of Alternatives, is a new start.

In FY 2022, Program Element (PE) 1203109N, Satellite Communications (SPACE), efforts were transferred to PE 1203109SF, Narrowband Satellite Communications, in order to meet the intent with the president's Space Policy Directive-4 and to align with Office of the Under Secretary of Defense (OUSD) direction to transfer the Mobile User Objective System (MUOS) from the Department of the Navy to the United States Space Force (USSF).

A. Mission Description and Budget Item Justification

Mobile User Objective System (MUOS) provides a worldwide, multi-service population of mobile and fixed-site terminal users with Ultra High Frequency (UHF) Narrowband, beyond line of sight satellite communications (SATCOM). MUOS significantly increases performance and capacity in support of critical Combatant Command SATCOM priorities. MUOS is the replacement system for the UHF Follow-on (UFO) system, which is currently beyond its design life.

MUOS is comprised of Space, Ground, and User Entry Segments. The Space Segment consists of 5 geosynchronous satellites, which includes an on-orbit spare, and provides both a legacy UHF payload backward compatible with UFO and a Wideband Code Division Multiple Access (WCDMA) payload, which provides 3G cellular-like capability. The MUOS legacy capability has been in operational use since 2012; the WCDMA capability transitioned to early Combatant Command use in July 2016 and was accepted for full operations in March 2020.

The Ground Segment consists of four world-wide Radio Access Facilities (RAFs) and two satellite control facilities. Each RAF includes three 60 ft. antennas, and numerous racks of equipment. The RAFs in Hawaii and Virginia each include a Switching Facility (SF), and the RAF in Hawaii includes a Network Management Facility (NMF). The User Entry Segment consists of the MUOS waveform that is ultimately integrated into MUOS-capable terminals. In addition to providing UHF SATCOM for the Department of Defense, the USSF has the overall responsibility to deliver the End-to-End (E2E) MUOS capability to the warfighter. This responsibility involves systems engineering, integration, and test management of all MUOS system of system activities.

In accordance with a Department of Defense Chief of Information Office assessment, anticipated narrowband satellite communication losses led to the recommendation for Office of Under Secretary of Defense (OUSD) Acquisitions & Sustainment and OUSD Cost Assessment and Program Evaluation (CAPE) direction for Navy to

initiate MUOS Service Life Extension (SLE) to acquire and launch two additional MUOS satellites (without legacy payloads). The SLE is projected to extend the 70% constellation availability for the Wideband Code Division Multiple Access (WCDMA) capability to 2034 and extend the ground segment life to support satellites to 2039.

The FY 2022 program funds system optimization and modernization to address the dynamic, worldwide electromagnetic and cybersecurity environment in which MUOS operates. Efforts include technical analysis and engineering efforts for technology insertion and necessary software changes driven by the warfighter and radio program offices to align end-to-end MUOS capabilities with warfighter missions. Funds are required to continue MUOS ground and waveform migration to Advance Cryptographic Capability (ACC). Funds are also required for Service Life Extension (SLE) risk reduction design studies for MUOS 6 and 7, and studies and efforts for MUOS ground life extension. The USSF will conduct a narrowband analysis of alternatives to determine the way ahead beyond the MUOS system.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the MUOS weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	112.012	0.000	112.012
Total Adjustments	0.000	0.000	112.012	0.000	112.012
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	112.012	0.000	112.012

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203109SF *I Narrowband Satellite Communications*

Change Summary Explanation

In FY 2022, Program Element 1203109N, Satellite Communications (SPACE), efforts were transferred to PE 1203109SF, Narrowband Satellite Communications, in order to meet the intent of the president's Space Policy Directive-4 and to align with OUSD direction to transfer the MUOS from the Department of the Navy to the USSF. -$2.40M due to inflation adjustment. -$81.600M due to SLE launch schedule alignment.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Mobile User Objective System (MUOS) Baseline ***Description:*** System optimization and modernization to address the dynamic, worldwide electromagnetic and cybersecurity environment in which MUOS operates. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** Continue migration of MUOS ground infrastructure to Advanced Cryptographic Capability (ACC) from Enhanced FireFly Communications Security (COMSEC) which includes changes to MUOS waveform software and artifacts, software updates to existing KG-175 devices, and updates to MIL-STD-188-187A and associated terminal certification program. Continue system optimization and electro-magnetic interference mitigation efforts to ensure capacity is available to the end user. Continue E2E MUOS Usability Enhancements and improvements to over-the-air provisioning and profile portability. Pending a successful JCTD demonstration and military utility assessment in CY 2021, implement an operationally relevant and viable UHF Legacy Extension (ULX) system to mitigate Legacy UHF communications shortfalls. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to increased efforts for system cryptographic capability migration, system optimization, and electromagnetic interference mitigation, and ULX migration.	-	0.000	70.133
Title: Mobile User Objective System (MUOS) Service Life Extension (SLE) ***Description:*** MUOS Service Life Extension (SLE) to acquire and launch two additional MUOS satellites (without legacy payloads). ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** Initiate Risk Reduction Design studies for MUOS 6 and 7 Service Life Extension (SLE) satellites.	-	0.000	29.879

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203109SF *I Narrowband Satellite Communications*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Address emerging cybersecurity requirements to ensure continued system security and availability. Perform ground life extension studies and initiate migration efforts to a digital processing ground system that is more resilient and responsive to mitigating emerging threats ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021. In FY 2022, the program office will award multiple MUOS trade studies to determine necessary changes to the original MUOS design.			
Title: Narrowband Analysis of Alternatives ***Description:*** Conduct analysis of alternatives for narrowband communications beyond MUOS. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** Begin studies bounding the expected solutions regarding requirements definition and technology maturity. Conduct analysis of alternatives to provide narrowband SATCOM capabilities to the joint warfighter beyond the MUOS system. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021. The Narrowband Analysis of Alternatives will begin in FY 2022.	-	0.000	12.000
Accomplishments/Planned Programs Subtotals	-	0.000	112.012

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPSF 01 BA01 MUOS00: *Mobile User Objective System*	-	-	45.544	0.000	45.544	-	-	-	-	-	-

Remarks

E. Acquisition Strategy

The program has awarded the Ground and User Entry Segment sustainment contracts. Contractor support for MUOS 6 and 7 trade studies will be procured via system engineering contracts in FY 2022. Up to two vendors will be awarded contracts in FY 2023 to complete preliminary design activities for MUOS 6 and 7.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203109SF / *Narrowband Satellite Communications*	**Project (Number/Name)** 673109 / *SATCOM MUOS*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Contract (SLE)	SS/ Various	General Dynamics : Scottsdale, AZ	0.000	-		-		7.842	Nov 2021	-		7.842	-	-	-
Risk Reduction Design Studies (SLE)	C/FFP	TBD : TBD	0.000	-		-		13.273	Oct 2021	-		13.273	-	-	-
Crypto Replacement Plans and Interfaces (SLE)	MIPR	NSA : Fort Meade, MD	0.000	-		-		0.553	Nov 2021	-		0.553	-	-	-
Engineering Contract (Baseline)	SS/ Various	General Dynamics : Scottsdale, AZ	0.000	-		-		64.174	Nov 2021	-		64.174	-	-	-
Electromagnetic Interference (Baseline)	C/CPFF	Adaptive Dynamics Inc : San Diego, CA	0.000	-		-		4.284	Nov 2021	-		4.284	-	-	-
Narrowband Analysis of Alternatives (AoA)	TBD	Various : Various	0.000	-		-		12.000	Dec 2021	-		12.000	-	-	-
		Subtotal	0.000	-		-		102.126		-		102.126	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC (SLE)	MIPR	Various : Various	0.000	-		-		3.252	Oct 2021	-		3.252	-	-	-
A&AS (SLE)	C/CPFF	Various : Various	0.000	-		-		4.207	Jan 2022	-		4.207	-	-	-
Other Support (SLE)	Various	Various : TBD	0.000	-		-		0.752	Oct 2021	-		0.752	-	-	-
A&AS (Baseline)	C/CPFF	Various : Various	0.000	-		-		0.693	Jan 2022	-		0.693	-	-	-
Other Support (Baseline)	Various	Not specified. : TBD	0.000	-		-		0.982	Oct 2021	-		0.982	-	-	-
		Subtotal	0.000	-		-		9.886		-		9.886	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		0.000		112.012		-		112.012	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203109SF / *Narrowband Satellite Communications*	**Project (Number/Name)** 673109 / *SATCOM MUOS*

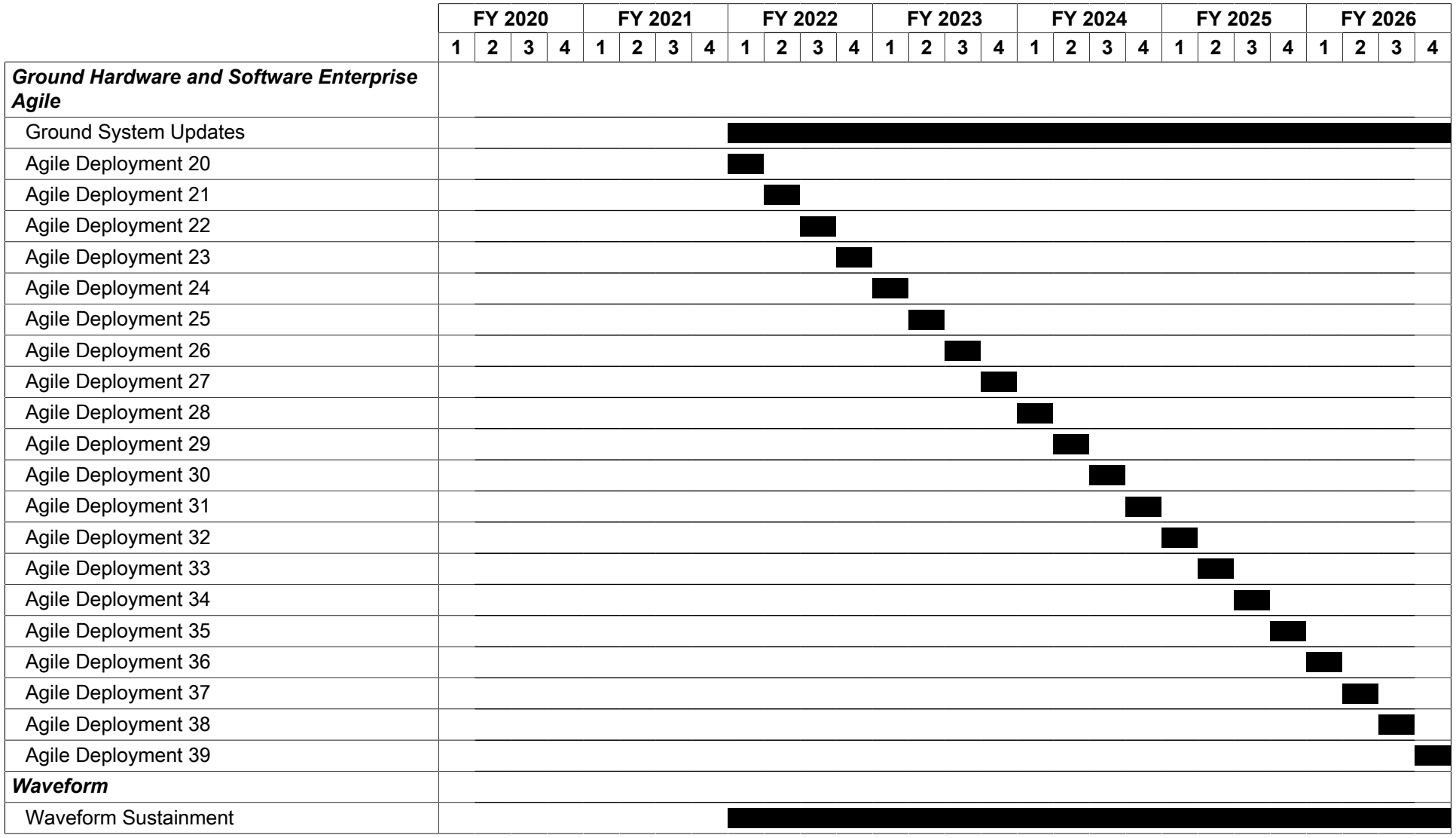

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203109SF / *Narrowband Satellite Communications*	**Project (Number/Name)** 673109 / *SATCOM MUOS*

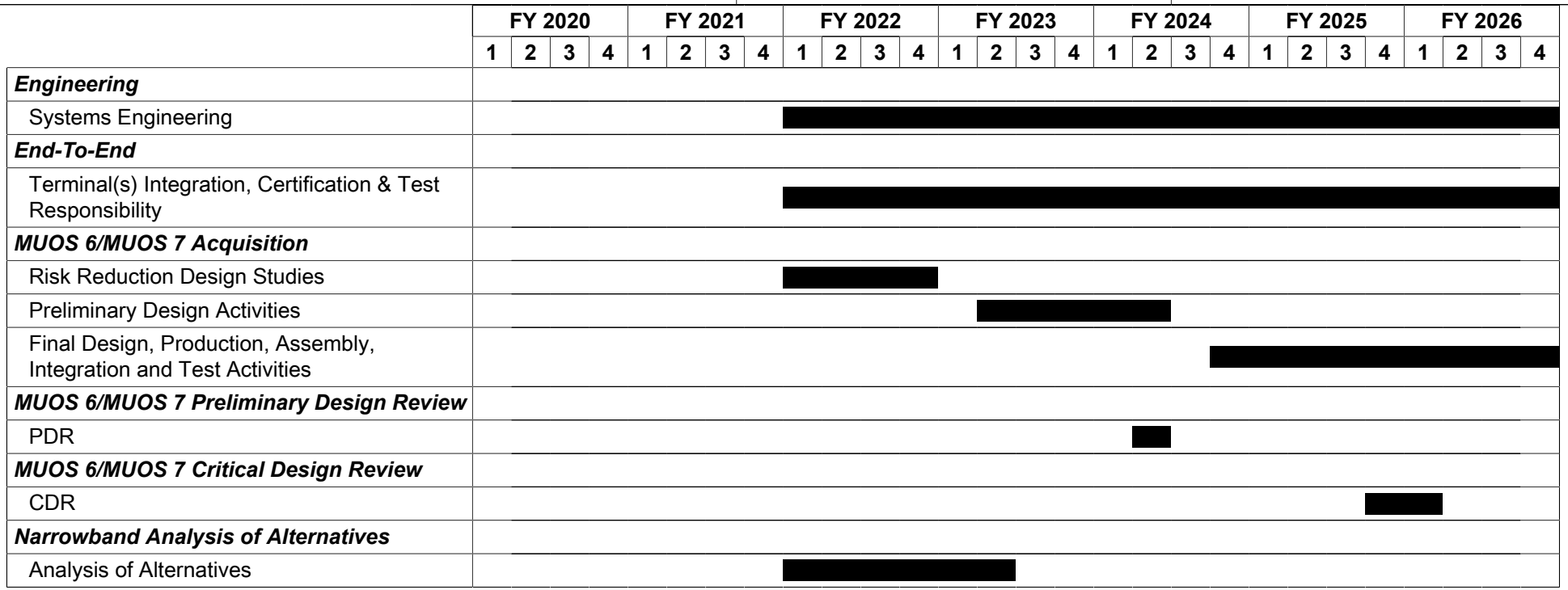

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203109SF / *Narrowband Satellite Communications*	**Project (Number/Name)** 673109 / *SATCOM MUOS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Ground Hardware and Software Enterprise Agile				
Ground System Updates	1	2022	4	2026
Agile Deployment 20	1	2022	1	2022
Agile Deployment 21	2	2022	2	2022
Agile Deployment 22	3	2022	3	2022
Agile Deployment 23	4	2022	4	2022
Agile Deployment 24	1	2023	1	2023
Agile Deployment 25	2	2023	2	2023
Agile Deployment 26	3	2023	3	2023
Agile Deployment 27	4	2023	4	2023
Agile Deployment 28	1	2024	1	2024
Agile Deployment 29	2	2024	2	2024
Agile Deployment 30	3	2024	3	2024
Agile Deployment 31	4	2024	4	2024
Agile Deployment 32	1	2025	1	2025
Agile Deployment 33	2	2025	2	2025
Agile Deployment 34	3	2025	3	2025
Agile Deployment 35	4	2025	4	2025
Agile Deployment 36	1	2026	1	2026
Agile Deployment 37	2	2026	2	2026
Agile Deployment 38	3	2026	3	2026
Agile Deployment 39	4	2026	4	2026

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203109SF / *Narrowband Satellite Communications*	**Project (Number/Name)** 673109 / *SATCOM MUOS*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Waveform				
Waveform Sustainment	1	2022	4	2026
Engineering				
Systems Engineering	1	2022	4	2026
End-To-End				
Terminal(s) Integration, Certification & Test Responsibility	1	2022	4	2026
MUOS 6/MUOS 7 Acquisition				
Risk Reduction Design Studies	1	2022	4	2022
Preliminary Design Activities	2	2023	2	2024
Final Design, Production, Assembly, Integration and Test Activities	4	2024	4	2026
MUOS 6/MUOS 7 Preliminary Design Review				
PDR	2	2024	2	2024
MUOS 6/MUOS 7 Critical Design Review				
CDR	4	2025	1	2026
Narrowband Analysis of Alternatives				
Analysis of Alternatives	1	2022	2	2023

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203110SF / *Satellite Control Network (SPACE)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	60.480	36.810	0.000	36.810	-	-	-	-	-	-
673276: *Satellite Control Network*	-	0.000	60.480	36.810	0.000	36.810	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2022, PE 1203040SF, Defense Cyber Operations - Space efforts were transferred from PE 1203110SF Satellite Control Network (SPACE), Budget Activity 07 due to the creation of a new Program Element for Defense Cyber Operations - Space.

The Satellite Control Network (SCN) is a satellite ground terminal network comprised of two communication nodes (Schriever SFB & Vandenberg SFB) and 15 antenna systems. The antennas are distributed around the globe at seven locations -- Vandenberg Tracking Station (VTS), Diego Garcia Station (DGS), Guam Tracking Station (GTS), Hawaii Tracking Station (HTS), New Hampshire Tracking Station (NHS), Thule Tracking Station (TTS) and Telemetry and Commanding Station (TCS) at RAF Oakhanger, England -- to ensure global coverage for over 170 satellites in various orbits. The SCN conducts an average of 450+ satellite contacts per day supporting Positioning, Navigation and Timing (PNT), Intelligence, Surveillance and Reconnaissance (ISR), Missile Warning, Communications, Weather, Launch Vehicle Support, and Research and Development (R&D) in support of Department of Defense (DoD), Intelligence Community (IC), and National Aeronautics and Space Administration (NASA) operations. While most of the 450+ satellite contacts/day are routine command and control activities, the SCN is also used for satellite emergencies (e.g. tumbling satellite) because its high power antennas are often the only earthbound assets that can contact a non-responsive satellite to re-establish command & control. During each Fiscal Year, the SCN supports multiple space vehicle emergencies resulting in the preservation of over $4B worth of satellites. In addition to routine and emergency satellite operations C2, the SCN provides support to launch vehicle and early orbit operations, ensuring worldwide antennas receive telemetry as the rocket travels through the atmosphere and transmit commands to a newly orbiting satellite to initiate early orbit checkout. During each Fiscal Year, the SCN supports multiple launches delivering 14B worth of satellites to their operational orbits. Finally, the SCN provides Factory Compatibility Testing (FCT) to ensure satellites and rockets can communicate via the SCN before the satellite is launched. These funds are used to develop next-generation tools to improve the SCN and ensure the capability is available to support DoD, Intelligence Community, and civil users. These efforts support cyber hardening, and Systems Engineering & Integration (SE&I) activities for the space enterprise, as well as align with the evolving future space domain demands through Ground Enterprise Next (GEN) to include transmit and receive, and data transport. SCN efforts also include deficiency resolution, test, cyber security, requirements management, system planning, analysis and architecture support.

The SCN portfolio also manages commercial/federal antenna augmentation services for satellite command and control (C2) and enterprise networking solutions. This includes Satellite Operations Transmit and Receive and Satellite C2 Augmentation Services to provide the means to communicate with all future spacecraft through diverse communication networks. These efforts provide more capable ground based antennas, space based communication links, augmenting the existing SCN with commercial and federal antennas, upgrading satellite scheduling to commercial standards, and developing infrastructure network solutions compatible with the Air Force and Space Force for long haul terrestrial communications driven by increase in antennas, cyber security and resilience requirements. In FY 2021, the Multi-Band Multi-Mission (MBMM) Tech Maturation concluded.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203110SF / *Satellite Control Network (SPACE)*

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program /project priorities according to an integrated unclassified /classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SCN weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	75.480	53.679	0.000	53.679
Current President's Budget	0.000	60.480	36.810	0.000	36.810
Total Adjustments	0.000	-15.000	-16.869	0.000	-16.869
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-15.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-16.869	0.000	-16.869

Change Summary Explanation

FY 2021: - 15.000M; funding decreased for under execution.

FY 2022: - $16.742M; funds reduced $14.236M for higher Space Force Space priorities; -$2.176M transferred to DCO-S program PE 1203040SF; -0.456M inflation adjustment.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: SCN Deficiency Resolution	-	5.276	2.586
Description: Provides test, cyber security, requirements management, and system architecture support to the SCN. Additionally, the SCN is investigating multiple cyber defense tools for integration onto the SCN baseline.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203110SF *I Satellite Control Network (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: Continue to address deficiencies in fielded systems to include Remote Tracking Station Block Change, Enhanced High Power Amplifier and SCN Scheduling Tool (AST). Begin future architecture design and planning to utilize automated scheduling and ground resource management capabilities. Future architecture design and planning will include assessment of existing automated scheduling tools, review of pathfinding activities and assessment of needed infrastructure updates. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Refine architecture design and planning to utilize automated scheduling and ground resource management capabilities. Begin initial automated scheduling implementation and infrastructure upgrade activities and changes. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to decreasing trend in fielded system deficiencies needing resolution.			
Title: Satellite Operations Transmit and Receive	-	47.507	7.933
Description: Provides enterprise transmit, receive and resource management solutions to enable continuous satellite operations (SATOPS) during contested, degraded and operationally denied environment. Provides updates to SCN legacy system capability shortfalls. These updates include modernization of current scheduling, resource management, and development execution for future integrated and automated resource management and scheduling services. Additionally, the SCN will integrate with multiple enterprise cyber defense tools for as part of the baseline. ***FY 2021 Plans:*** Complete CAS development activities and begin development/operational testing. Begin requirement development for Advance Planning Scheduling System (APSS)/Enterprise Resource Management (ERM). Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. Award Commercial Augmentation Services and Federal Augmentation development and integration contracts. ***FY 2022 Plans:*** Begin development and integration for APSS. Complete AST deployment. Continue to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:***			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203110SF *I Satellite Control Network (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2022 decreased compared to FY 2021 due to AST initial deployment completion and breakout of CAS development into a separate major thrust for transparency.			
Title: Satellite C2 Augmentation Services ***Description:*** This is not a new start, it is continued work under current plans (previously under the Satellite Operations Transmit and Receive major thrust) but now separated to more clearly distinguish the work needed for commercial and federal augmentation services (CAS). Provide augmented satellite C2 services in addition to SCN capabilities. This thrust includes commercial and federal resources to perform satellite operations. Augmented services are planned to be deployed in a phased approach to address early integration and security concerns while providing initial C2 capability to and reduced dependency on SCN. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** Continue federal and CAS development activities. Begin development work for integration into consolidated antenna as a service infrastructure/system. Continue to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to establishing a separate major thrust for CAS efforts.	-	0.000	21.644
Title: Defensive Cyberspace Operations - Space (DCO-S) ***Description:*** Funding supports cyber hardening and Defensive Cyberspace Operations for Space (DCO-S) activities for the space enterprise. Provides space enterprise defensive cyber solutions to counter advanced persistence cyber threats, through rapid fielding of operational prototypes using agile development methods. This effort implements a combined Development/Security/Operations (DevSecOps) framework which incorporates methodologies, technologies, and tools to deeply embed security best practices into the modern software development workflow and tool-chain. This effort will institute four product lines: Manticore (detect), Pegasus (protect), Chimera (identify), and Kraken (respond). The DCO-S capabilities are developed and deployed as an agile program, leveraging a DevSecOps framework to facilitate rapid and timely fielding to operations. ***FY 2021 Plans:***	-	2.137	0.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203110SF *I Satellite Control Network (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue to enhance Defensive Cyber Operations for Space (DCO-S) enterprise-wide, through development and integration of Defensive Cyber Operations tools, including Manticore (Detect), Pegasus (Protect), Chimera (Identify), and Kraken (Respond) product lines. Manticore will leverage machine learning while continuing to develop, integrate and field endpoint and network data collection, and data extraction and fusion analytic capabilities for robust enterprise cyber defense. Pegasus will continue to address hardware and software supply chain risk management (HW/SW SCRM), enterprise cryptography, and cyber hardening activities. Chimera will continue to develop threat identification through system characterization, vulnerability mapping, and cyber/ intelligence integration. In addition, DCO-S will integrate product line efforts with DoD Big Data Platform initiatives. Kraken will continue to develop capability for incident management, forensics, and tailored response. Collectively these tool capabilities will fill cyber deficiencies across the space enterprise and enable the Joint All-Domain Command and Control in a future conflict. Continue to plan and deploy DCO-S product line capabilities to the following mission sets: Protected Communications, Integrated Tactical Warning and Attack Assessment, and Command and Control Satellite Operations, Space Situational Awareness, Precision Navigation and Timing, Launch, and Nuclear Command Control and Communications. DCO-S will explore cyber defense technologies that will protect in-fused sensor and artificially intelligent systems, as part of the Joint All Domain Command Control initiative. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to transfer of DCO-S funding to PE 1203040SF.			
Title: Enterprise Systems Engineering and Integration (SE&I)	-	5.560	4.647
Description: SE&I manages the government controlled system and subsystem level baseline requirements including analysis of future changes to the fielded baseline. SE&I provides "government as the integrator" engineering support to ensure multiple separate modernizations and the sustainment baselines are synchronized. SE&I will develop and recommend investment strategies to keep the SCN operating well beyond the Future Years Defense Plan. ***FY 2021 Plans:*** Continue Program Office support and independent SE&I efforts as required to integrate development and modernization across the SCN. Provide systems and subsystem level definition, baseline, architecture, integration planning and support for the SCN. Additionally, SE&I will provide support to Space & Missile Systems Center (SMC) initiatives supporting Ground Enterprise Next			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203110SF *I Satellite Control Network (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
(GEN) activities. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Continue Program Office support and independent SE&I efforts as required to integrate development and modernization across the SCN. Provide systems and subsystem level definition, baseline, architecture, integration planning and support for the SCN and augmented services. Additionally, SE&I will provide support to Space & Missile Systems Center (SMC) initiatives supporting Ground Enterprise Next (GEN) activities. Continue to support implementation of system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to increased requirements maturation.			
Accomplishments/Planned Programs Subtotals	-	60.480	36.810

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

E. Acquisition Strategy

DT&E efforts focus on completing upgrades as well as future architectures and studies to ensure the best use of investment funding.

SCN acquisition strategy is evolving from completing obsolescence, resiliency, and cyber security upgrades for existing satellite C2 network assets to future planning for the evolution of the SCN architecture to increase efficiency and resiliency of SCN operations. This evolution will integrate the commercial and federal augmentation services with the SCN to create a comprehensive system for Advanced Planning and Scheduling System (APSS) / Enterprise Resource Management (ERM).

The SE&I contractor maintains the DoD Architecture Framework (DoDAF) architecture and requirements baseline for Government approval and may perform studies to determine Government options. Limited RDT&E will be applied to the Consolidated SCN Modifications, Maintenance, and Operations (CAMMO) contract when sustaining engineering expertise is needed to finalize Government-approved architectures. Federally Funded Research and Development Corporation technical depth and breadth will be leveraged to ensure SCN modernization efforts are compatible with mission rules and do not pose a risk to safe and cost-effective satellite contacts.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203110SF / *Satellite Control Network (SPACE)*	**Project (Number/Name)** 673276 / *Satellite Control Network*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ground Enterprise Next (GEN) - Scheduling	Various	Stottler-Henke : Colorado Springs, CO : TBD	-	-		10.900	Jan 2021	2.444	Jan 2022	-		2.444	-	-	-
SCN Deficiency Resolution	Various	Various : Colorado Springs, CO : TBD	-	-		5.276	May 2021	2.586	May 2022	-		2.586	-	-	-
C2 Augmentation (CAS)	Various	TBD; TBD : TBD	-	-		23.486	Oct 2020	21.644	Oct 2021	-		21.644	-	-	-
Defensive Cyberspace Operations for Space (DCO-S)	Various	Various : Colorado Springs, CO : TBD	-	-		2.137	Dec 2020	0.000		-		0.000	-	-	-
Enterprise Systems Engineering and Integration (SE&I)	SS/CPIF	ENSCO : Colorado Springs, CO : TBD	-	-		5.560	Nov 2020	4.647	Nov 2021	-		4.647	-	-	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA : TBD	-	-		6.982	Apr 2021	1.504	Apr 2022	-		1.504	-	-	-
		Subtotal	-	-		54.341		32.825		-		32.825	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	Various	Aerospace Corp, : El Segundo, CA : TBD	-	-		0.903	Apr 2021	0.930	Apr 2022	-		0.930	-	-	-
A&AS	Various	TBD:TBD : TBD	-	-		5.236	Apr 2021	3.055	Apr 2022	-		3.055	-	-	-
		Subtotal	-	-		6.139		3.985		-		3.985	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		60.480		36.810		-		36.810	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203110SF / *Satellite Control Network (SPACE)*	**Project (Number/Name)** 673276 / *Satellite Control Network*

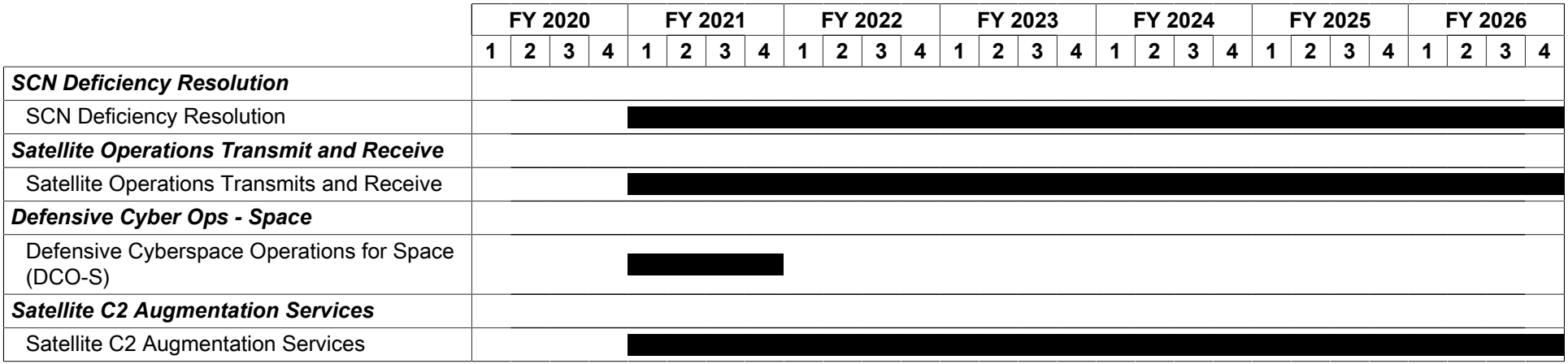

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203110SF / *Satellite Control Network (SPACE)*	**Project (Number/Name)** 673276 / *Satellite Control Network*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
SCN Deficiency Resolution				
SCN Deficiency Resolution	1	2021	4	2026
Satellite Operations Transmit and Receive				
Satellite Operations Transmits and Receive	1	2021	4	2026
Defensive Cyber Ops - Space				
Defensive Cyberspace Operations for Space (DCO-S)	1	2021	4	2021
Satellite C2 Augmentation Services				
Satellite C2 Augmentation Services	1	2021	4	2026

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203165SF *I NAVSTAR Global Positioning System (Space and Control Segments)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	1.984	1.966	0.000	1.966	-	-	-	-	-	-
67A025: *GPS Enterprise Integrator*	-	0.000	1.984	1.966	0.000	1.966	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Detailed information on this effort remains classified and will be provided on a need-to-know basis.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver [enter program name here] for weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	1.984	1.991	0.000	1.991
Current President's Budget	0.000	1.984	1.966	0.000	1.966
Total Adjustments	0.000	0.000	-0.025	0.000	-0.025
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-0.025	0.000	-0.025

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203165SF *I NAVSTAR Global Positioning System (Space and Control Segments)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Classified Effort ***Description:*** Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 Plans:*** Classified effort ***FY 2022 Plans:*** Classified effort. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY2022 increased compared to FY2021. Justification for this increase is classified.	-	1.984	1.966
Accomplishments/Planned Programs Subtotals	-	1.984	1.966

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203165SF / *NAVSTAR Global Positioning System (Space and Control Segments)*	Project (Number/Name) 67A025 / *GPS Enterprise Integrator*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Classified Effort	Various	Various : Various	-	-		1.984		1.966		-		1.966	-	-	-
		Subtotal	-	-		1.984		1.966		-		1.966	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		1.984		1.966		-		1.966	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203165SF / *NAVSTAR Global Positioning System (Space and Control Segments)*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*

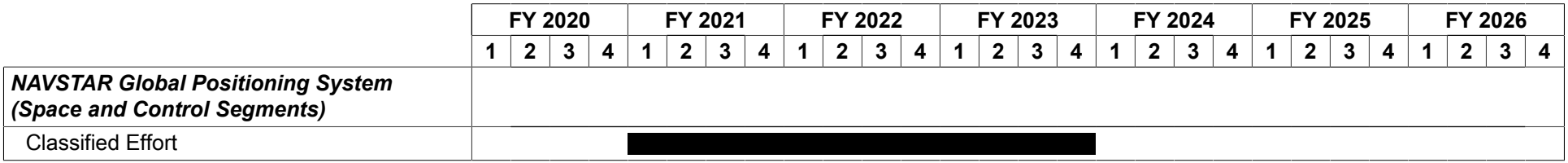

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203165SF / *NAVSTAR Global Positioning System (Space and Control Segments)*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
NAVSTAR Global Positioning System (Space and Control Segments)				
Classified Effort	1	2021	4	2023

Note

Classified effort; details will be provided on a need-to-know basis.

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203173SF / *Space and Missile Test and Evaluation Center*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	4.397	1.699	0.000	1.699	-	-	-	-	-	-
67A014: *R&D Space & Missile Operations*	-	0.000	4.397	1.699	0.000	1.699	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Research and Development Space and Missile Operations (RDSMO) program, executed by the Innovation and Prototyping Directorate at Kirtland AFB, NM, conducts space and missile Research and Developmental Test and Evaluation (RDT&E) and Initial Operational Test and Evaluation (IOT&E) to support prototype experimental, demonstration, and operational satellites within the RDT&E Support Complex (RSC) at Kirtland AFB, NM and at Schriever SFB, CO. Additionally, this program augments the Air Force Satellite Control Network (AFSCN) with the Mobile Range Flight (MRF) which is a deployable system supporting launch and early orbit efforts for a variety of customers. The RDSMO program develops, acquires, delivers, integrates, tests, operates and sustains the Multi-Mission Satellite Operations Center (MMSOC) satellite command and control (C2) Ground System Enterprise (GSE) which includes a host of fixed/deployable telemetry, tracking, and commanding (TT&C) antenna systems in support of USSF and DoD missions. This program also leads the transfer of certain on-orbit missions to operational command organizations such as U.S. Space Command.

The objective of the RDSMO Program is to develop and integrate technology to rapidly support R&D, prototype and operational space systems. Specifically, the MMSOC is leveraged to expedite the acquisition, integration, and operations cycle and to enable a Satellite Control Authority (SCA) transition to Schriever SFB. The RDSMO program provides beneficial space vehicle technology directly to the warfighting organizations for continued experimentation or operations. MMSOC uses a combination of standard and developmental hardware and software to:
(1) perform satellite C2 in support of launch requirements;
(2) develop tactics, techniques, and procedures to conduct satellite operations;
(3) provide a satellite C2 incremental block evolution resource for RDT&E of new satellite and C2 systems and concepts; and
(4) deliver operational flexibility for new and legacy satellite missions designed to outpace adversary on-orbit systems.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

The program element may include necessary civilian pay expenses required to manage, execute, and rapidly deliver warfighting capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203173SF *I Space and Missile Test and Evaluation Center*

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	4.397	4.013	0.000	4.013
Current President's Budget	0.000	4.397	1.699	0.000	1.699
Total Adjustments	0.000	0.000	-2.314	0.000	-2.314
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-2.314	0.000	-2.314

Change Summary Explanation

The FY 2022 funding request was reduced by 2.293M to account for the availability of prior year execution balances; and reduced by 0.021M to adjust for inflation.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: MMSOC Development	-	4.397	1.699
Description: Evolution of the Ground Services Architecture (GSA) through the Multi-Mission Satellite Operations Center (MMSOC). Development, integration, and test of common services for space vehicle prototype and operational capabilities, including shared orbital analysis and mission planning tools, data distribution and dissemination, cyber defense, cloud computing, multi-security level operations, and enhanced ground entry points for geosynchronous proto-ops.			
FY 2021 Plans: Continue providing capability to USSF HQ for reduced cost of operations and maintenance through evolution of the ground services architecture and automated processes. Integrate EGS backwards functionality into MMSOC C2. Continue Long Duration Propulsive Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) (LDPE)-1 & 2 while providing initial support to Tetra-1 & 2 and LDPE-3A & 4 mission C2. Provide backup to Enterprise Ground Services (EGS) program mission schedule.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203173SF / *Space and Missile Test and Evaluation Center*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue support to the USSF-12 payload, Navigation Technology Satellite-3 (NTS-3) and Tetra prototyping projects. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Continue providing capability to USSF for reduced cost of operations and maintenance (O&M) through evolution of MMSOC C2 architecture and automated processes and integrate the Enterprise Ground System (EGS) backwards functionality into MMSOC C2. Continue capabilities studies such as Cloud Computing, combining antennas, and containerization of services to reduce O&M costs. Optimize the multi-mission operations floor. Continue the experimental campaign and/or transition the residual use of the LDPE-1 & 2. Continue to ensure RDSMO resources are available for the successful mission accomplishment of the USSF-12 Payload, Navigation Technology Satellite-3 (NTS-3) and Tetra prototyping projects. Host mission operations of Space Rapid Capability Office (SpRCO) and the Quasi-Zenith Satellite System (QZSS) hosted payload. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased from FY 2021 to adjust for expected timing of when funds are needed.			
Accomplishments/Planned Programs Subtotals	-	4.397	1.699

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPSF 01 GNRLIT: *General Information Tech - Space*	-	1.926	1.938	-	1.938	-	-	-	-	-	-

Remarks

E. Acquisition Strategy

Modernize ground system capabilities and leverage MMSOC sustainment as a test bed for new ground service development, integration testing, and operations. The US Space Force competitively awarded the new Engineering, Development, Integration, and Sustainment (EDIS) contract in 2020 in support of MMSOC, MRF and EGS

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203173SF *I Space and Missile Test and Evaluation Center*

activities. Additionally, RDSMO plans to competitively award a Prototype Operations (POPS)-1 Contract and utilize an Advisory & Assistance Support (A&AS) contract. These contracts are all managed by Space and Missile Systems Center (SMC).

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203173SF / *Space and Missile Test and Evaluation Center*	**Project (Number/Name)** 67A014 / *R&D Space & Missile Operations*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Ground Services R&D Engineering, Development, Integration, and Test	C/CPAF	SAIC : Albuquerque, NM	-	-		2.268	Oct 2020	0.438	Oct 2021	-		0.438	-	-	-
		Subtotal	-	-		2.268		0.438		-		0.438	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Space Test and Engineering Contract (STEC) (MMSOC)	C/CPFF	Linquest : Kirtland AFB, NM	-	-		1.612	Oct 2020	0.265	Oct 2021	-		0.265	-	-	-
Prototype Operations-1 (POPS-1)	C/CPFF	Not specified. : TBD	-	-		0.000		0.789	Dec 2021	-		0.789	-	-	-
		Subtotal	-	-		1.612		1.054		-		1.054	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS- METIS	C/FFP	Linquest : Los Angeles, CA	-	-		0.217	Feb 2021	0.207	Feb 2022	-		0.207	-	-	-
FFRDC- Aerospace	SS/FP	Aerospace : Los Angeles, CA	-	-		0.300	Oct 2020	0.000	Oct 2021	-		0.000	-	-	-
		Subtotal	-	-		0.517		0.207		-		0.207	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		4.397		1.699		-		1.699	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203173SF / *Space and Missile Test and Evaluation Center*	**Project (Number/Name)** 67A014 / *R&D Space & Missile Operations*

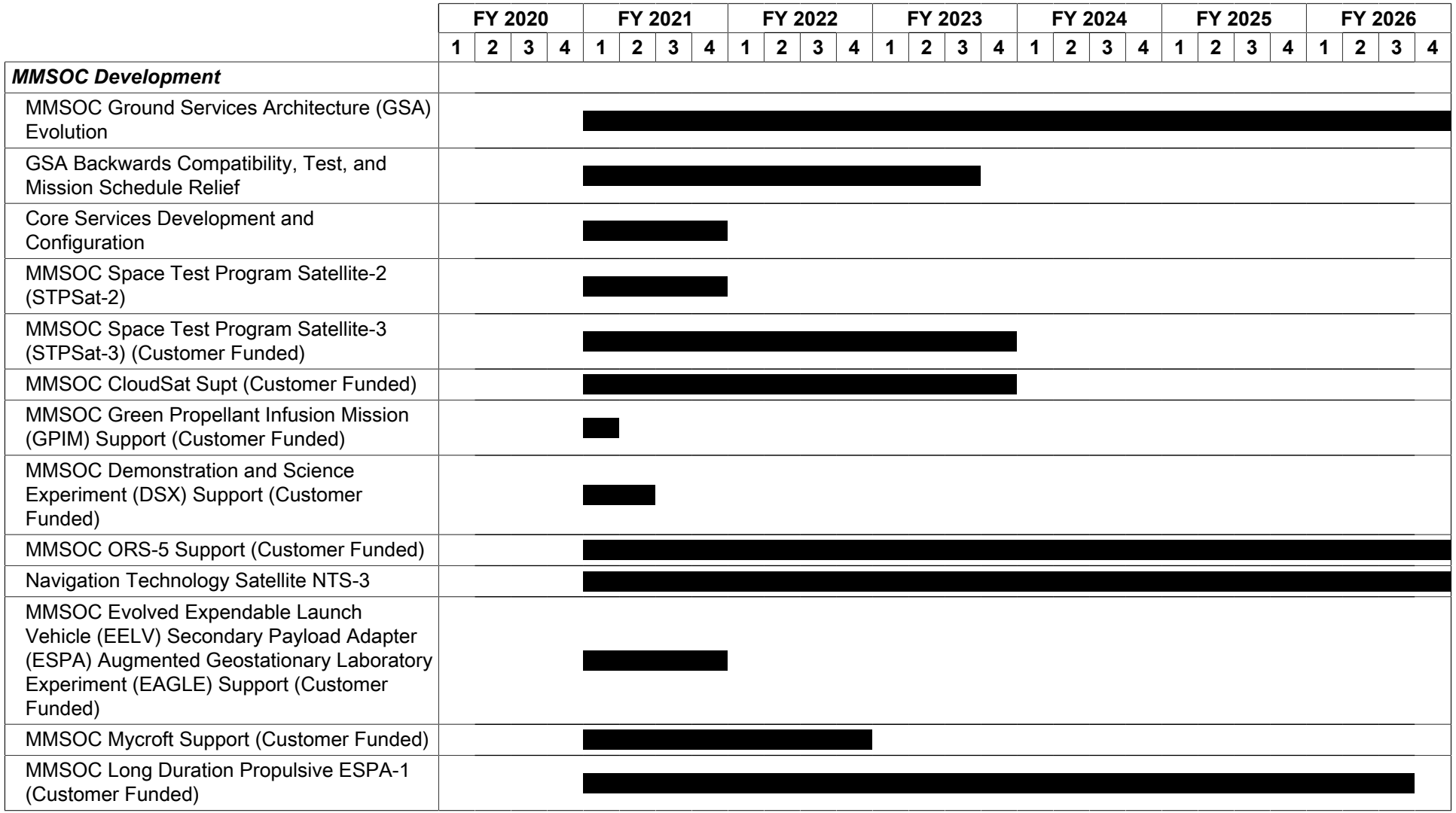

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203173SF / *Space and Missile Test and Evaluation Center*	**Project (Number/Name)** 67A014 / *R&D Space & Missile Operations*

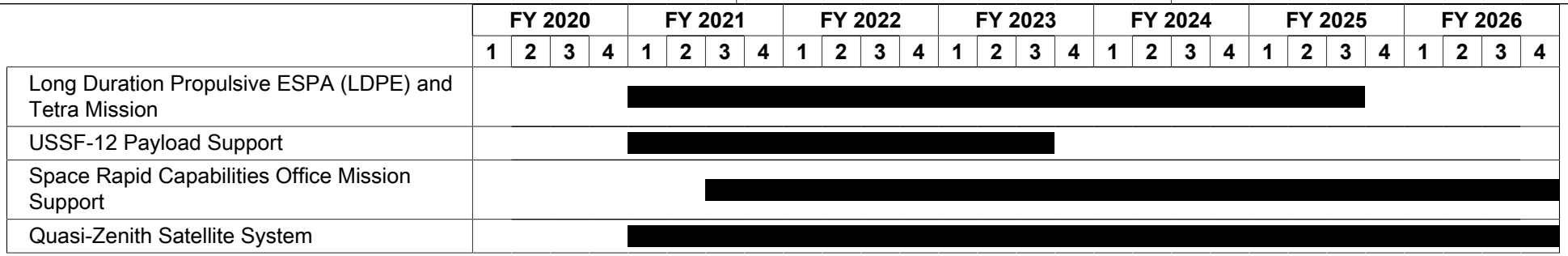

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203173SF / *Space and Missile Test and Evaluation Center*	**Project (Number/Name)** 67A014 / *R&D Space & Missile Operations*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
MMSOC Development				
MMSOC Ground Services Architecture (GSA) Evolution	1	2021	4	2026
GSA Backwards Compatibility, Test, and Mission Schedule Relief	1	2021	3	2023
Core Services Development and Configuration	1	2021	4	2021
MMSOC Space Test Program Satellite-2 (STPSat-2)	1	2021	4	2021
MMSOC Space Test Program Satellite-3 (STPSat-3) (Customer Funded)	1	2021	4	2023
MMSOC CloudSat Supt (Customer Funded)	1	2021	4	2023
MMSOC Green Propellant Infusion Mission (GPIM) Support (Customer Funded)	1	2021	1	2021
MMSOC Demonstration and Science Experiment (DSX) Support (Customer Funded)	1	2021	2	2021
MMSOC ORS-5 Support (Customer Funded)	1	2021	4	2026
Navigation Technology Satellite NTS-3	1	2021	4	2026
MMSOC Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) Augmented Geostationary Laboratory Experiment (EAGLE) Support (Customer Funded)	1	2021	4	2021
MMSOC Mycroft Support (Customer Funded)	1	2021	4	2022
MMSOC Long Duration Propulsive ESPA-1 (Customer Funded)	1	2021	3	2026
Long Duration Propulsive ESPA (LDPE) and Tetra Mission	1	2021	3	2025
USSF-12 Payload Support	1	2021	3	2023
Space Rapid Capabilities Office Mission Support	3	2021	4	2026
Quasi-Zenith Satellite System	1	2021	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203174SF / *Space Innovation, Integration and Rapid Technology Development*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	38.746	18.054	0.000	18.054	-	-	-	-	-	-
67A011: *Space Analysis and Application Development*	-	0.000	38.746	18.054	0.000	18.054	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Located at Peterson SFB, Colorado, the Space Innovation, Integration and Rapid Technology Development (SIIRTD) program develops and modifies modeling and simulation tools that Air Force Space Command's Space Analysis Center uses for operations research, military utility analyses, tradeoff studies, and other evaluations of space mission areas to guide planning, programming, requirements generation, analyses of alternatives, and other activities. Development activities incorporate changes in fielded and projected space operational capabilities, as well as technical improvements, into the group's software tools to ensure their data and technology remain current. Space Training Simulators develop and upgrades space training emulators using Standard Space Trainer (SST) to meet Space Mission Force (SMF) threat-based, advanced training requirements as well as funds connection to Distributed Mission Operations (DMO) training networks. Finally, its innovation, education, and training activities foster solutions to operational deficiencies and enhance the integration of space systems into Air Force operations, thereby enabling service and joint warfighters to realize the full potential of existing and planned space capabilities.

Programs and projects in the space warfighting enterprise are evaluating ways to increase innovation and resiliency to known and emerging threats. Space enterprise efforts aim to execute technology risk reduction efforts, integration of new or repurpose existing capabilities, enterprise decision-making tools, experimentation, and rapid prototyping and fielding via all appropriate acquisition authorities and contract mechanisms.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver SIIRTD weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203174SF *I Space Innovation, Integration and Rapid Technology Development*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	44.746	24.643	0.000	24.643
Current President's Budget	0.000	38.746	18.054	0.000	18.054
Total Adjustments	0.000	-6.000	-6.589	0.000	-6.589
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-6.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-6.589	0.000	-6.589

Change Summary Explanation

FY 2021: -6.000M; Congressional reduction for prior year carryover.
FY 2022: +11.375M; funding increased to incorporate SST into a Virtual Space Range (VSR) Modeling & Simulation (M&S) tool set, and develop Threat M&S capabilities into the SSTs.

The FY 2022 funding request was reduced by $17.738 million to account for the availability of prior year execution balances

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Model/Tool Development and Capability Upgrades	0.000	9.993	15.224

Description: Develops, verifies, and validates models for space mission areas and modifies existing models to portray new capabilities that meet the national senior leader intent. Advancing Modeling & Simulation (M&S) tools to incorporate space effects at the campaign, mission and engagement levels with the goal of enhancing decision support, visualization, exercise and wargaming. Rapidly meet downward-directed guidance implementing the system resiliency and situational awareness necessary to win in a contested space domain. Activities may include, but are not limited to, acquisition, program office support, studies, technical analysis, prototyping, etc. The space M&S is used for military utility analyses, trade studies, and other space program evaluations supporting OSD, Joint Staff, Headquarters Air Force, Headquarters United States Space Force, and the USSF Field Commands.

FY 2021 Plans:
-Complete the development and integration of current space effects in the campaign model (STORM) used by AF/DoD.
-Provide decision support to POM and force structure decisions as well as OPLAN risk assessments using STORM
-Continue development of mission level models/tools (AFSIM/SEAS) to support USSF senior leadership decisions

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203174SF *I Space Innovation, Integration and Rapid Technology Development*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
-Provide operation assessment to the 18th Space Control Squadron streamlining the conjunction assessment process -Increase analysis and M&S support to USSF Space Staff -Continue supporting S4 with Logistic Sustainment Predictive Analysis -Continue the COMSFFOR tool development -Continue to conduct verification and validation of model changes resulting from model development and modification efforts. ***FY 2022 Plans:*** Continue development and integration of space effects in campaign and mission level models/tools to support POM and force structure decisions as well as OPLAN risk assessments. Continue to increase analysis and M&S support to USSF Space Staff. Continue to conduct verification and validation of model changes resulting from model development and modification efforts. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A - Inflation increase only			
Title: Standard Space Trainer Development ***Description:*** Develop/upgrade Standard Space Trainer (SST) simulators to meet Space Mission Force (SMF) threat-based, advanced training requirements as well as build connectivity to Distributed Mission Operations (DMO) training networks. Follows direction set out in USAF Operational Training Infrastructure (OTI) Flight Plan, as well as meets STRATCOM Integrated Priority List (IPL) priorities. ***FY 2021 Plans:*** Continue development of functionality enabling initial through advanced training capabilities for 1st Space Operations (1 SOPS) missions and Space-Based Infrared System (SBIRS) SST as well as begin development on Bounty Hunter SST and Perimeter Acquisition Radar Attack Characterization System (PARCS) SST. Continue ongoing enterprise mission training and DMO-S M&S development for Blue/White/Red consoles based on evolving mission requirements and threat analyses. ***FY 2022 Plans:*** Accelerate completion of Bounty Hunter SST and PARCS SST development. Complete GSSAP SST, UEWR SST, and Advanced Training capabilities for MILSATCOM SSTs. Continue developing SST into an advanced/warfighter training capability. Incorporate SSTs into a Virtual Space Range (VSR) Modeling and Simulation (M&S) tool set and developing additional products to support USSF and Mission Partner Advanced Training (AT) events across distributed networks including Red Console (Threat M&S), Event Visualization, and Exercise Control. VSR projects will also include upgrades to integrate M&S tools into the cloud-based training environment. Without these improvements the advanced training (Threat M&S) capability within an SST will not be possible, limiting SSTs' training capability to basic (peacetime) weapon system operation.	0.000	28.753	2.830

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203174SF *I Space Innovation, Integration and Rapid Technology Development*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased due to acceleration of SBIRS SST Advanced Training development into FY2021 and deferring a subset of VSR requirements into FY 2023.			
Accomplishments/Planned Programs Subtotals	0.000	38.746	18.054

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPAF 01 GNRLIT: *General Information Tech - Space*	1.350	-	-	-	-	-	-	-	-	-	-
• SPSF GNRLIT: *General Information Tech - Space*	-	1.373	1.397	-	1.397	-	-	-	-	-	-

Remarks

Funding and content procures equipment for the SIIRTD AFSPC Virtual Analysis Capability (AVAC) system. Supports space and cyber modeling & analysis using a variety of Linux and Windows based hardware and software suites. Also procures Information Technology (IT) hardware and software infrastructure for the Distributed Communications Architecture for HQ ACC.

E. Acquisition Strategy

Any new project funded in this program will be awarded using competitive procedures to the maximum extent possible.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203174SF / *Space Innovation, Integration and Rapid Technology Development*	Project (Number/Name) 67A011 / *Space Analysis and Application Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Model/Tool Development, Verification & Validation	C/CPAF	Perduco Group : Dayton, OH	-	0.000		9.933	Nov 2020	5.829	Nov 2021	0.000		5.829	-	-	-
Space Training Simulator Development	C/CPAF	Sonalysts Inc : Waterford, CT	-	0.000		28.813	Dec 2020	12.225	Dec 2021	0.000		12.225	-	-	-
		Subtotal	-	0.000		38.746		18.054		0.000		18.054	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	0.000		38.746		18.054		0.000		18.054	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203174SF / *Space Innovation, Integration and Rapid Technology Development*	**Project (Number/Name)** 67A011 / *Space Analysis and Application Development*

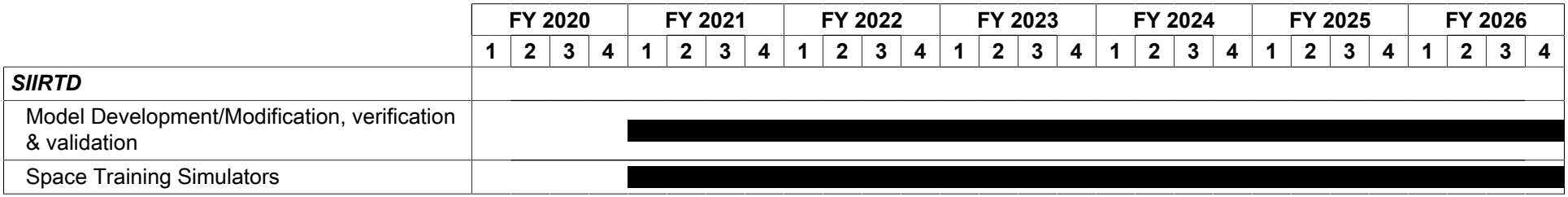

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203174SF / *Space Innovation, Integration and Rapid Technology Development*	**Project (Number/Name)** 67A011 / *Space Analysis and Application Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
SIIRTD				
Model Development/Modification, verification & validation	1	2021	4	2026
Space Training Simulators	1	2021	4	2026

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203182SF *I Spacelift Range System (SPACE)*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	21.020	11.115	0.000	11.115	-	-	-	-	-	-
674137: *Launch and Test Range System (LTRS) Modernization*	-	0.000	21.020	11.115	0.000	11.115	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Spacelift Range System (SLRS), also known as the Launch and Test Range System (LTRS), provides public safety and assured access to space. LTRS operates at the Eastern Range (ER) at Patrick SFB/Cape Canaveral AFS, FL and the Western Range (WR) at Vandenberg SFB, CA. LTRS provides tracking, telemetry, communications, flight safety, and other capabilities to support launch of national security space (NSS), civil and commercial space payloads, Intercontinental and Sea Launched ballistic missile and missile defense evaluations, and aeronautical and guided weapon tests. LTRS enables national security, civil, and commercial spacelift operations to be conducted safely; together with national security space launch capability, LTRS provides assured access to space for the nation. The ER and WR are designated as Department of Defense Major Range and Test Facility Bases (MRTFB).

LTRS is comprised of twelve subsystems that together provide this capability to the ranges. The Range Safety and Command Destruct subsystems provide the capability to destroy an errant rocket, if necessary to protect public safety. These subsystems rely on the Telemetry, Radar, and Optics subsystems to provide tracking data. The Weather and Surveillance subsystems allow range operators and customers to determine if conditions are safe for launch. The Communications, Data Handling, and Timing & Sequencing subsystems ensure critical data is expeditiously routed from remote sensors (e.g. radars, optics) to range operators and customers. Finally, the Planning and Scheduling subsystem ensures all assets are available when needed for a launch or test operation.

The Space Force requires RDT&E funds to conduct digital data processing and transport prototype projects supporting Range of the Future (ROTF) launch operations. Funds will: provide engineering and analysis to develop promising technology; validate LTRS architecture capability to meet the accelerating national launch requirement; and introduce advanced data transport formats. These efforts include demonstration of virtualized and remote data processing as well as dispersed and disaggregated flight tracking.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver LTRS weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203182SF *I Spacelift Range System (SPACE)*

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	11.020	11.253	0.000	11.253
Current President's Budget	0.000	21.020	11.115	0.000	11.115
Total Adjustments	0.000	10.000	-0.138	0.000	-0.138
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	10.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-0.138	0.000	-0.138

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 674137: *Launch and Test Range System (LTRS) Modernization*		
Congressional Add: *Space Launch and Services Capability*	-	10.000
Congressional Add Subtotals for Project: 674137	-	10.000
Congressional Add Totals for all Projects	-	10.000

Change Summary Explanation

FY 2021: $10M; Congressional Add for space launch services and capability.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Enterprise Systems Engineering and Integration to Support Government-Controlled Baseline	-	3.534	2.080
Description: SE&I manages the government controlled system and subsystem level baseline requirements including analysis of future changes to the fielded baseline. SE&I provides "government as the integrator" engineering support to ensure multiple separate modernizations and the sustainment baseline are synchronized. SE&I will develop and recommend investment strategies to keep the Eastern and Western Ranges operating well beyond the FYDP.			
FY 2021 Plans:			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203182SF *I Spacelift Range System (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Increase system resiliency and agility to meet National launch capacity and cadence requirements per Chief of Space Operations Range of the Future (ROTF) agility to meet National launch requirements. Sustain Major Range and Test Facility Base (MRTFB) activity capability. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased due to ramping down of analytic and development requirements.			
Title: LTRS Range Technology Integration ***Description:*** Provides Advisory and Assistance Services (A&AS) support of the operational baseline (all twelve subsystems) to include configuration management of all range assets, requirements analyses, and special studies. Provides support for Systems Program Office operations, Systems Engineering and Technical Assistance (SETA), and Federally Funded Research and Development Centers (FFRDC). Strategically executes experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose capabilities. ***FY 2021 Plans:*** Analyze, engineer and prototype Range of the Future (ROTF) concepts to increase LTRS authorization, data transport and data processing. Develop telemetry data virtual processing capability and test dispersed and disaggregated telemetry receipt and processing concepts. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Continue efforts to analyze, engineer and prototype ROTF concepts. Prototype data-driven applications to provide agile flight vehicle situational awareness as well as automation of LTRS equipment to facilitate rapid range reconfiguration and enable conduct of simultaneous launch operations. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased due to application prototyping efforts.	-	7.486	9.035
Accomplishments/Planned Programs Subtotals	-	11.020	11.115

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203182SF *I Spacelift Range System (SPACE)*

	FY 2020	FY 2021
Congressional Add: Space Launch and Services Capability	-	10.000
FY 2021 Plans: Congressional Add Funding will be used to improve commercial spaceport capability to provide mid-to-low inclination orbits or polar-to-high inclination orbits in support of the national security space at Pacific Spaceport Complex, AK and Mid-Atlantic Regional Spaceport, Wallops Island, VA.		
Congressional Adds Subtotals	-	10.000

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPSF 1203182SF: *Spacelift Range System (Space)*	0.000	90.492	93.774	0.000	93.774	-	-	-	-	-	-

Remarks

E. Acquisition Strategy

Range of the Future (ROTF) ensures LTRS Architecture is not a constraint to the accelerating National launch cadence executing on the ER and WR. Innovative utilization of digital data processing and distribution is targeted as enabling the ROTF capability. Promising prototypes and technology will be leveraged into LTRS architecture investments delivering increased operational capacity and state-of-art data formatting and transport to launch operations. The competitively-selected SE&I contractor manages government-controlled requirements and processes as well as provide support to the "government as the integrator" between LTRS Integrated Support Contract (LISC) and separately competed modernization projects. FFRDC provides mission assurance oversight to ensure capabilities meet operational need.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203182SF / *Spacelift Range System (SPACE)*	**Project (Number/Name)** 674137 / *Launch and Test Range System (LTRS) Modernization*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Enterprise Systems Engineering and Integration	C/FPIF	ENSCO INC : Falls Church, VA	-	-		3.534	Oct 2020	2.080	Oct 2021	-		2.080	-	-	-
LTRS Range of the Future (ROTF) Technology Integration	C/Various	TBD : TBD	-	-		6.781	May 2021	8.310	May 2022	-		8.310	-	-	-
		Subtotal	-	-		10.315		10.390		-		10.390	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
AK Spaceport Infrastructure Support	SS/FFP	Alaska Aerospace Corp : Anchorage, AK	-	-		5.000	May 2021	-		-		-	-	-	-
VA Spaceport Infrastructure Support	SS/FFP	VA Comm Space Flt Auth : Norfolk, VA	-	-		5.000	May 2021	-		-		-	-	-	-
		Subtotal	-	-		10.000		-		-		-	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace : El Segundo, CA	-	-		0.485	Nov 2020	0.500	Nov 2021	-		0.500	-	-	-
OTHER SUPPORT	PO	Various : El Segundo, CA	-	-		0.220	Nov 2020	0.225	Nov 2021	-		0.225	-	-	-
		Subtotal	-	-		0.705		0.725		-		0.725	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203182SF / *Spacelift Range System (SPACE)*	Project (Number/Name) 674137 / *Launch and Test Range System (LTRS) Modernization*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		21.020		11.115		-		11.115	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203182SF / *Spacelift Range System (SPACE)*	**Project (Number/Name)** 674137 / *Launch and Test Range System (LTRS) Modernization*

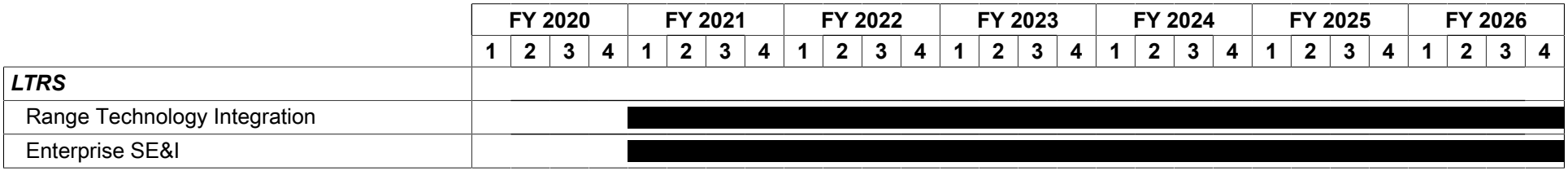

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203182SF / *Spacelift Range System (SPACE)*	**Project (Number/Name)** 674137 / *Launch and Test Range System (LTRS) Modernization*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
LTRS				
Range Technology Integration	1	2021	4	2026
Enterprise SE&I	1	2021	4	2026

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203265SF / *GPS III Space Segment*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	10.777	7.207	0.000	7.207	-	-	-	-	-	-
67A019: *GPS III*	0.000	0.000	10.777	7.207	0.000	7.207	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Program MDAP/MAIS Code: 292												

A. Mission Description and Budget Item Justification

The Global Positioning System (GPS) is a space-based navigation system that fills validated Joint Service requirements for worldwide, accurate, common-grid three-dimensional positioning/navigation for military aircraft, ships, and ground personnel. The consistent accuracy, unaffected by location or weather and available in real time, significantly improves effectiveness of reconnaissance, weapons delivery, mine countermeasures, and rapid deployment for all services. GPS must comply with Title 10 United States Code (USC) Sec. 2281, which requires that the Secretary of Defense ensure continued sustainment and operations of GPS for military and civilian purposes, and 51 USC Sec. 50112, which requires that GPS comply with certain standards and facilitate international cooperation.

The system is composed of three segments: User Equipment (funded under Program Element (PE) 1203164F), Space (funded under this PE and PE 1203269F) and a Control Network (funded under PE 1203165SF and PE 1206423SF). The satellites broadcast high-accuracy data using precisely synchronized signals that are received and processed by user equipment installed in military platforms. The user equipment computes the platform position and velocity and provides steering vectors to target locations or navigation waypoints. The control segment provides daily updates to the navigation messages broadcast from the satellites to maintain system precision in three dimensions to 16 meters (spherical error probable) worldwide. Additionally, GPS supports the United States Nuclear Detonation (NUDET) Detection System (USNDS) mission and provides strategic and tactical support to the following Department of Defense (DoD) missions: Joint Operations by providing capabilities for Positioning, Navigation, and Timing (PNT); Command, Control, Communications, and Intelligence (C3I); Special Operations; Military Operations in Urban Terrain (MOUT); Defense-Wide Mission Support; Air Mobility; and Space Launch Orbital Support.

GPS III is the latest generation SV supporting the GPS constellation and is funded in PE 1203265SF. GPS III SVs will deliver significant enhancements, including a new international civil (L1C) Galileo-compatible signal, and enhanced anti-jam power. GPS III SVs 05-10 are in the Production and Deployment Phase.

PE 1203265SF funds GPS III and supports RDT&E of GPS III SVs 01-02 and risk-reducing simulators through a systems engineering approach that matures and delivers SVs for launch. This program includes SVs 01-02 engineering studies and analyses, trade studies, system development, test and evaluation efforts, integrated logistics support products, on-orbit support, and mission operations support for civil and military applications that protect U.S. military and allied use of GPS. The program also includes Contingency Operations (COps) as a bridge capability to fly GPS III SVs until the delivery of the GPS OCX program.

Mission Readiness Campaign (MRC) activities include launch preparation, planning, mission readiness testing to validate space-ground-user interfaces, mission crew exercises and rehearsals, launch vehicle integration, and On-Orbit Checkout activities to validate performance prior to launch and post launch. Newly certified launch

vehicles must be incorporated into the GPS III launch baseline. Integration requires the development of plans and procedures and procurement of special support equipment.

GPS supports the early deployment of Global M-Code to meet a congressional mandate limiting user equipment purchase to M-Code capable receivers starting in FY 2017. The funds will cover the M-Code Early Use (MCEU) program and support development costs associated with the GPS control segment software to provide core M-Code capabilities to the warfighter, as well as the ability to command and control, process, and monitor the M-Code signal. MCEU mitigates delays with GPS OCX, supports MGUE testing, and allows for early M-Code operations. M-Code provides greater security to protect navigation and timing in electronically contested environments.

Impacts of the M-Code deployment include:
-Compliance with The US Space Command Commander's mandate to provide global monitoring necessary for early M-code operational use and verification of NAVWAR effects.
-Direction to improve the resiliency of the GPS capability.
-Confirmation that Enterprise modernization efforts are integrated and properly deployed.
-Testing and Verification of M-Code capability on MGUE/GPS III solution and early M-Code use tied to MGUE fielding.

The feasibility studies and preliminary engineering analyses that are funded by this budget item will determine whether an initiative to host GPS M-Code augmentation payloads on other satellite systems is practical and beneficial. The primary goal is to provide additional mission assurance through redundant systems not directly connected with the current U.S. GPS satellite constellation.

This PE encompasses the GPS III (SVs 01-10) and MCEU.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/" classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver (specify name) weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203265SF / *GPS III Space Segment*	

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	10.777	7.296	0.000	7.296
Current President's Budget	0.000	10.777	7.207	0.000	7.207
Total Adjustments	0.000	0.000	-0.089	0.000	-0.089
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-0.089	0.000	-0.089

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: GPS III SVs 01-02	-	7.145	7.207
Description: Development, test, and evaluation of GPS III SVs 01-02 and associated simulators, on orbit engineering, engineering studies and analyses, trade studies, system development, test and evaluation efforts, and integrated logistics support products. ***FY 2021 Plans:*** Continue support of software test assets and maintenance of secure network equipment and mission planning tools. Continue support of launch readiness test activities, updates to operational documentation, and training on exercise and rehearsal tools. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** FY 2022 funding will support activities that include product development through life testing, technical mission analysis, information assurance, technical support, system engineering, mission operations, support of test assets, maintenance of network equipment and mission planning tools, and contract closeout activities. Additionally, FY 2022 funding will the allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to activities associated with final development, test, and initiation of contract close out.			
Title: Architecture Evolution Plan (AEP) M-Code Monitoring	-	3.632	0.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203265SF *I GPS III Space Segment*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: The M-Code Early Use (MCEU) program initiative covers the development costs associated with updating the legacy control segment software, AEP, with additional capabilities needed to provide M-Code operations. MCEU provides the Combined Space Operations Center (CSpOC) with command and control (C2), processing, and integrity monitoring for the M-Code signal. The development also includes the integration of modernized Monitor Station Technology Improvement Capability (MSTIC) receivers, which are being procured separately using Operations and Maintenance (O&M) funding as a Form- Fit- Functional replacement for the legacy Monitor Station Receiver Element (MSRE) Y-Code receivers. MCEU adds a software upgrade to MSTIC receivers to allow it to process M-Code signals. Prime contract was awarded to start software development and test activities; includes insertion of Legacy Hot Start, Demilitarized Zone, and Receiver Protection Profile requirements into the MCEU baseline. ***FY 2021 Plans:*** Complete Operational Test and Evaluation (OT&E), performance assessment and contract closeout activities. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to program completion in FY21.			
Accomplishments/Planned Programs Subtotals	-	10.777	7.207

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPSF 01 GPSIII: *GPS III Space Segment*	-	20.122	84.452	-	84.452	-	-	-	-	-	-

Remarks

E. Acquisition Strategy

The GPS III next generation space segment (SV 01-10) rapidly and affordably responds to warfighter capability requirements. The acquisition approach utilizes a disciplined systems engineering approach which focuses on mitigating cost and schedule risk through a lower-risk incremental delivery of mature technologies. This approach focuses on mission success and on-time delivery. The GPS III SVs will have GPS IIF capabilities plus up to a 3x-8x increase in anti-jam signal power, 3x improved accuracy, 3+ year increased design life, a new international civil (L1C) signal compatible with the European Galileo system, and a satellite bus capable of supporting future SV capability additions.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203265SF *I GPS III Space Segment*

On 21 Jan 2017, PEO Space approved the Acquisition Strategy for the MCEU program. The MCEU acquisition strategy enables the GPS Enterprise to provide core M-Code capabilities to the warfighter prior to GPS OCX delivery. MCEU supports the scheduled operational testing of MGUE. MCEU updated the GPS control segment software, AEP, to allow for command and control, processing, and integrity monitoring of the M-Code signal. MCEU acquires this capability by using the existing GPS III prime contract vehicle to modify the operational AEP software.

The Air Force approved reinstatement of a previously deferred Key Support Area (KSA) on 10 Feb 2016. The MSTIC receivers currently under development will get a software upgrade to process M-Code data. This $7.96M project to procure the M-MSTIC receivers was funded through both O&M and SPAF funds in FY 2016-FY 2018. Performance monitoring, integration, and test will be conducted by the MCEU program and sustained under the Global Positioning Operations Support and Sustainment Division contract with Lockheed Martin.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203265SF / *GPS III Space Segment*	Project (Number/Name) 67A019 / *GPS III*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS III Development	C/CPIF	Lockheed Martin : Denver, CO	0.000	-		1.305	Dec 2020	1.048	Dec 2021	-		1.048	-	-	-
GPS III SV01-02 On Orbit Incentive Fee	C/CPIF	Lockheed Martin : Denver, CO	0.000	-		0.547	Jan 2021	-		-		-	-	-	-
GPS III Tech & Eng Support	C/Various	Lockheed Martin : Denver, CO	0.000	-		0.000	Dec 2020	0.000	Jan 2022	-		0.000	-	-	-
GPS III Technical Mission Analysis	MIPR	Various : Various	0.000	-		0.756	Dec 2020	0.584	Jan 2022	-		0.584	-	-	-
GPS III Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	0.000	-		1.862	Oct 2020	0.951	Jan 2022	-		0.951	-	-	-
GPS III Launch Support	RO	45th : Cape Canaveral, FL	0.000	-		1.475	Mar 2021	2.593	Feb 2022	-		2.593	-	-	-
MCEU Development	C/CPIF	Lockheed Martin : Denver, CO	0.000	-		1.022	Dec 2020	-		-		-	-	-	-
		Subtotal	0.000	-		6.967		5.176		-		5.176	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS III FFRDC	MIPR	Various : El Segundo, CA	0.000	-		1.044	Apr 2021	-		-		-	-	-	-
GPS III A&AS	Various	Various : Various	0.000	-		1.691	Apr 2021	2.031	Jan 2022	-		2.031	-	-	-
GPS III Other Support	Various	Various : Various	0.000	-		1.075	Oct 2020	0.000	Oct 2021	-		0.000	-	-	-
		Subtotal	0.000	-		3.810		2.031		-		2.031	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		10.777		7.207		-		7.207	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203265SF / *GPS III Space Segment*	**Project (Number/Name)** 67A019 / *GPS III*

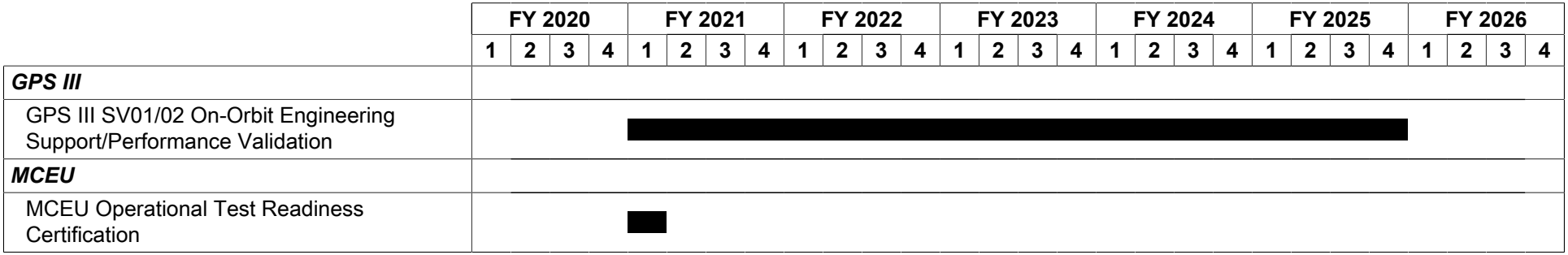

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203265SF / *GPS III Space Segment*	**Project (Number/Name)** 67A019 / *GPS III*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
GPS III				
GPS III SV01/02 On-Orbit Engineering Support/Performance Validation	1	2021	4	2025
MCEU				
MCEU Operational Test Readiness Certification	1	2021	1	2021

Note

GPS III SV01/SV02 will perform on-going on-orbit engineering support and performance validation through FY 2025.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203330SF / *Space Superiority ISR*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	16.810	18.109	0.000	18.109	-	-	-	-	-	-
67A051: *Space Superiority - Advanced Intelligence Systems*	-	0.000	16.810	18.109	0.000	18.109	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Per congressional direction, in FY 2021, PE 1203400SF, Space Superiority Intelligence efforts were transferred to PE 1203330SF, Space Superiority ISR, for inclusion in Space Force portfolio.

The Space Superiority Intelligence, Surveillance and Reconnaissance (ISR) (SSI) program provides ISR and Electronic Support (ES) for key find, fix, track, target, engage and assess (F2T2EA) requirements supporting Space Superiority activities meeting Combatant Command (CCMD) needs. SSI funds developmental intelligence activities to support new space superiority capability acquisition and development. Funds associated developmental ISR Planning and direction, Collection, Processing and exploitation, Analysis and production, Dissemination and integration (PCPAD) capabilities providing Battlespace Awareness and Space Domain Awareness (SDA) in support of Space Superiority and Space Control. This includes funding for fixed and transportable intelligence collection, Processing/Exploitation and Dissemination (PED), analysis and production capabilities that are modular (plug-and-play), meet Risk Management Framework Accreditation requirements and can keep pace with technological advances and emerging threats. It provides intelligence support systems for SDA activities that provide the requisite current and predictive knowledge of space events and threat conditions and intelligence support to Space Security and Defense Programs (SSDP) by providing architectural survivability analysis of critical mission assets for mission assurance, as well as network analysis. It also supports specialized/tailored, phased threat system analysis and studies (A&S), test support, lab equipment, and Material Acquisition and Exploitation (MAE) for system development, vulnerability, susceptibility assessments to support tactics, techniques and procedures (TTP) development and future threat technology studies necessary for mission area success and achievement of space superiority, and to preserve the US space advantage across all domains.

Space acquisition must respond with speed and agility to the proliferation of emerging space adversary threats and new technologies. In support of these nascent, cutting edge space acquisition capabilities, Space Superiority ISR provides exquisite, crucial cryptologic and ISR through transformational collection and production activities through the rapid development and fielding of fixed and transportable intelligence architectures capable of front-end collection and analysis of new technologies in near real time. Space Superiority and Space Control is only realized through Space Superiority ISR support on the front end of space acquisition, allowing maximized innovation and resiliency in support of changing program/project priorities to respond and to operate in the contested space domain, as well as supporting lifecycle experimentation, prototyping, and risk reduction.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203330SF / *Space Superiority ISR*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	16.810	18.109	0.000	18.109
Total Adjustments	0.000	16.810	18.109	0.000	18.109
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	16.810			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	18.109	0.000	18.109

Change Summary Explanation

FY 2021: Funds transferred from PE 1203400F for inclusion within Space Force portfolio.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Advanced Intelligence Systems for Space Superiority	0.000	16.810	18.109
Description: Develops transportable and fixed PCPAD capabilities. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** Continues Space Superiority RDT&E through transformation of collection and production activities by developing and fielding fixed and transportable intelligence architectures capable of front-end collection and analysis of new technologies in near realtime. This capability will be expanded across the Special Missions Enterprise to allow access to sensitive information from each point of presence providing production analysts the ability to rapidly exploit known vulnerabilities and develop new capabilities to counter adversary technological advances. ISR capabilities will be further developed and fielded to replace legacy systems, enhance automation and respond more quickly to ISR for Space needs. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** Funds transferred from PE 1203400F in FY 2021			
Accomplishments/Planned Programs Subtotals	0.000	16.810	18.109

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203330SF *I Space Superiority ISR*

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

All contracts funded in this program will be awarded using competitive procedures to the maximum extent possible.

Space Superiority and R&D Intelligence Development: Single Delivery, Cost-Plus-Fixed-Fee (CPFF), advisory and assistance contractor supporting development efforts. Prime contractor is
Macaulay-Brown.

Architecture upgrades to SDA, SSDP, and Space Superiority: Multiple Delivery, CPFF integration contract. Prime contractor is BITSYSTEMS Data Analysis.

Production development for R&D: Multiple Delivery, CPFF production contract supporting vulnerabilities analysis. Prime Contractor is Booz-Allen Hamilton Intelligence. systems

Testing and data collection: Multiple Delivery, CPFF production contract providing independent validation and verification of new capability development. Prime contractor is Booz-Allen Hamilton.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203330SF / *Space Superiority ISR*	**Project (Number/Name)** 67A051 / *Space Superiority - Advanced Intelligence Systems*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Space Superiority and R&D intelligence Development	C/CPFF	Various: TBD : TBD	-	-		1.817	Nov 2021	1.856	Nov 2021	0.000		1.856	-	-	-
Architecture upgrades to SDA, SSDP, and Space Superiority	C/CPFF	Various: TBD : TBD	-	-		9.586	Jun 2021	10.736	Jun 2022	0.000		10.736	-	-	-
Data analysis and product development for R&D	C/CPFF	Various: TBD : TBD	-	-		3.594	Nov 2021	3.667	Nov 2021	0.000		3.667	-	-	-
Intelligence systems testing and data collection	C/CPFF	Various: TBD : TBD	-	-		1.599	Feb 2021	1.631	Feb 2022	0.000		1.631	-	-	-
		Subtotal	-	-		16.596		17.890		0.000		17.890	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Mission Support	C/Various	Not Specified: TBD : TBD	-	-		0.214	Oct 2020	0.219	Oct 2021	-		0.219	-	-	-
		Subtotal	-	-		0.214		0.219		-		0.219	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		16.810		18.109		0.000		18.109	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203330SF / *Space Superiority ISR*	**Project (Number/Name)** 67A051 / *Space Superiority - Advanced Intelligence Systems*

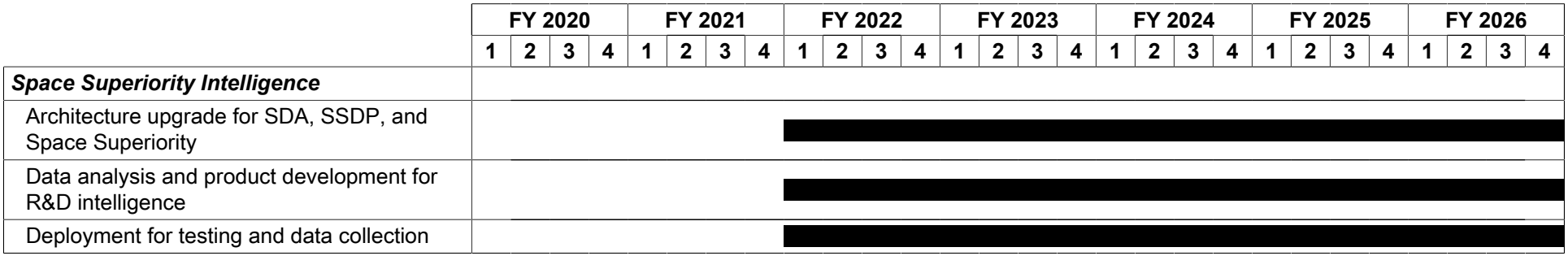

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203330SF / *Space Superiority ISR*	**Project (Number/Name)** 67A051 / *Space Superiority - Advanced Intelligence Systems*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Space Superiority Intelligence				
Architecture upgrade for SDA, SSDP, and Space Superiority	1	2022	4	2026
Data analysis and product development for R&D intelligence	1	2022	4	2026
Deployment for testing and data collection	1	2022	4	2026

Note

In FY 2021, PE 1203400F, Space Superiority Intelligence efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203330SF, Space Superiority ISR, Budget Activity 7, due to the creation of a new Appropriation for Space Force.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203620SF *I National Space Defense Center*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	2.687	1.280	0.000	1.280	-	-	-	-	-	-
670004: *OTHER STRATCOM ACTIVITIES*	-	0.000	2.687	1.280	0.000	1.280	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203620F, National Space Defense Center, Project 670004, OTHER STRATCOM ACTIVITIES efforts were transferred to PE 1203620SF, National Space Defense Center, Project 670004, OTHER STRATCOM ACTIVITIES, in order to align with Congressional direction.

This program develops and integrates Battle Management and Command and Control (BMC2) applications for the Joint Task Force - Space Defense (JTF-SD). JTF-SD is one of two subordinate commands to USSPACECOM and has the responsibility to protect and defend space assets from both terrestrial and space-based threats. The JTF-SD executes its mission through its operations center, the National Space Defense Center (NSDC) which was previously referred to as the Joint Interagency Combined Space Operations Center. NSDC efforts include integrating hardware and software prototypes to support various networks developed by mission partners and integrating applications developed by the Space C2 program to ensure relevant and accurate situational awareness to mission partners. NSDC also conducts early prototyping efforts to inform JTF-SD's ability to generate informed BMCR and space superiority requirements for the acquisition community. The JTF-SD (and NSDC) allows the national security space community to effectively respond to space threat events and will have the capability to develop, test, and integrate new space system tactics, techniques and procedures (TTPs) in support of both DoD and Intelligence Community operations.

The FY 2022 funding request was reduced by $1.456 million to account for the availability of prior year execution balances.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203620SF *I National Space Defense Center*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	2.687	1.280	0.000	1.280
Total Adjustments	0.000	2.687	1.280	0.000	1.280
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	2.687			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	1.280	0.000	1.280

Change Summary Explanation

The FY 2022 funding request was reduced by $1.456M to account for the availability of prior year execution balances; and reduced by $0.015M to adjust for inflation.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Application Development	-	2.687	1.280

Description: Develop and field Space Battle Management Command and Control capabilities.

FY 2021 Plans:

FY2021 Plans: Continue to analyze and assess mission partner and Intelligence Community networks and achieve authorization to connect to JTF-SD infrastructure. Partner with test agency to support developmental and operational test activities and shadow operations for agile DevOps environment. Implement system resiliency and situational awareness capability necessary to operate in the contested space domain. Activities include program office support, studies, technical analysis, experimentation, prototyping, and technical feedback to developers.

FY 2022 Plans:

FY 2022 Plans: Continue to analyze, assess, and provide operations center support for mission partner and Intelligence Community networks and achieve authorization to connect to JTF-SD infrastructure. Partner with test agency to perform developmental and operational test activities and shadow operations for agile DevOps environment. Increase integration efforts for Space C2 applications. Implement system resiliency and situational awareness capability necessary to operate in

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203620SF *I National Space Defense Center*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, and prototyping. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to NSDC reducing the scope of its BMC2 application development efforts.			
Accomplishments/Planned Programs Subtotals	-	2.687	1.280

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

NSDC provides funds to Department of the Air Force, DoD, and other partners to execute on their contracts in support of NSDC requirements. Additionally, NSDC funding secures contract support to develop and document the technical baseline and support major test and transition activities during each fiscal year.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203620SF / *National Space Defense Center*	Project (Number/Name) 670004 / *OTHER STRATCOM ACTIVITIES*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
SHADOW OPERATIONS CENTER DEVELOPMENT	Various	Various : Colorado Springs, CO	-	-		0.180	Jan 2021	-		-		-	-	-	-
BMC2 APPLICATION DEVELOPMENT AND INTEGRATION	Various	Various: : Colorado Springs, CO	-	-		1.006	Jan 2021	0.200	Jan 2022	-		0.200	-	-	-
SYSTEM ENGINEERING	Various	Various: : Colorado Springs, CO	-	-		-		0.506	Dec 2021	-		0.506	-	-	-
		Subtotal	-	-		1.186		0.706		-		0.706	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	Various: : Colorado Springs, CO	-	-		0.502	Jan 2021	0.200	Jan 2022	-		0.200	-	-	-
FFRDC	Various	Various: : Colorado Springs, CO	-	-		0.999	Dec 2020	0.374	Nov 2021	-		0.374	-	-	-
		Subtotal	-	-		1.501		0.574		-		0.574	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		2.687		1.280		-		1.280	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203620SF / *National Space Defense Center*	**Project (Number/Name)** 670004 / *OTHER STRATCOM ACTIVITIES*

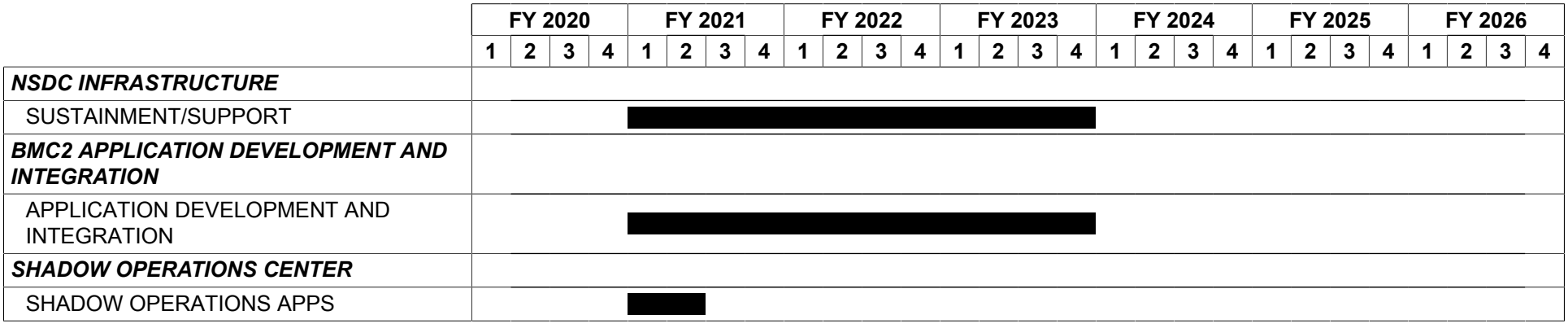

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203620SF / *National Space Defense Center*	**Project (Number/Name)** 670004 / *OTHER STRATCOM ACTIVITIES*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
NSDC INFRASTRUCTURE				
SUSTAINMENT/SUPPORT	1	2021	4	2023
BMC2 APPLICATION DEVELOPMENT AND INTEGRATION				
APPLICATION DEVELOPMENT AND INTEGRATION	1	2021	4	2023
SHADOW OPERATIONS CENTER				
SHADOW OPERATIONS APPS	1	2021	2	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203873SF / *Ballistic Missile Defense Radars*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	28.179	12.292	0.000	12.292	-	-	-	-	-	-
674820: *Sensor Development*	-	0.000	28.179	12.292	0.000	12.292	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

COBRA DANE (CD) is a 40+ year old radar located on Eareckson AS, AK (Shemya Island, AK). CD is the most powerful, sensitive, and accurate Ground-based Midcourse Defense (GMD) radar and the premier Ballistic Missile Defense (BMD) radar. At the same time, it is the most accurate and capable phased array available to the Space Surveillance Network (SSN) for cataloging hazardous and difficult-to-track satellites and space debris objects that clutter the near-earth orbital regime that cannot be detected by most other SSN tracking assets. CD has two primary missions. One is to support US Strategic Command's (USSTRATCOM) BMD mission by providing midcourse coverage for the Ballistic Missile Defense System (BMDS). CD detects Intercontinental Ballistic Missiles (ICBMs) and Sea-Launched Ballistic Missiles (SLBMs), classifies reentry vehicles (RVs) and other missile objects, provides real-time information to the GMD Fire Control (GFC), and provides tracking of threat ballistic missiles with sufficient accuracy to commit the launch of interceptors and to update the target tracks to the interceptor while the interceptor is in flight. CD's other primary mission is to support US Space Command (USSPACECOM)'s Space Domain Awareness (SDA) mission by detecting, tracking, correlating, and characterizing man-made resident space objects, primarily in the Low-Earth Orbit (LEO) regime, including space debris and early observation of New Foreign Launches (NFLs). It operates as part of the larger SSN and provides metric observation data to its command and control nodes: the Combined Space Operations Center (CSpOC) and the Distributed Space Command and Control - Dahlgren (DSC2-D). CD also supports USSPACECOM's Space Object Identification (SOI) mission by providing narrowband radar data of man-made resident space objects in the LEO regime. SOI information is used to ascertain the mission and operational status of various payloads and aids in forecasting maneuvers or deorbits.

CD will acquire a modern architecture through design, development, integration, and test. This architecture enhances mission capability, providing warfighter and stakeholder customers direct operational benefit. CD utilizes Federally Funded Research and Development Centers (FFRDC), Systems Engineering and Integration (SE&I), University Affiliated Research Center (UARC), and Assistance and Advisory Services (A&AS) contractors to support programmatic and technical activities. Activities include studies and analysis to support both current program planning and execution and future program planning. Specifically, the Automated Data Processing Equipment (ADPE) Rehost program upgrades the CD system's radar back-end mission data processing, radar management and control, and signal processing capabilities to a modern architecture that facilitates long-term mission resiliency, cyber security, system viability, high operational availability, and rapid hardware and software development and deployment capability. RDT&E funds were provided to the Missile Defense Agency (MDA) to accelerate the joint Department of the Air Force and MDA modernization program of the CD radar, which opened the door for a non-traditional acquisition approach using an Other Transaction Authority (OTA) agreement through the OSD Defense Innovation Unit (DIU) Organization. In addition to funds being used to modernize this back end of the radar, these funds will also be used for out-year planning of front-end component modernization including enhancement of communication elements.

The FY 2022 funding request was reduced by $3.639 million to account for the availability of prior year execution balances.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203873SF *I Ballistic Missile Defense Radars*

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/ classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver COBRA DANE weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	28.179	16.084	0.000	16.084
Current President's Budget	0.000	28.179	12.292	0.000	12.292
Total Adjustments	0.000	0.000	-3.792	0.000	-3.792
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-3.792	0.000	-3.792

Change Summary Explanation

FY 2022: -$3.639 reduction for execution and -$0.153 reduction for inflation adjustment

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: ADPE Rehost Upgrade, Phase II	-	28.179	12.292
Description: The Automated Data Processing Equipment (ADPE) Rehost (ADPE-R) project Phase II, Part 1 is complete. The ADPE-R project Phase II, Part 2 will transition to a traditional acquisition approach with two distinct capability deliveries. The Mission Computer replacement will be completed first, followed by a modernized Signal Processor, Radar Controller and Receiver. The approach will modernize these systems with an innovative hardware and software-based open architecture solution supported by switching solutions and modernized development environments.			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203873SF *I Ballistic Missile Defense Radars*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2021 Plans: Planned projects include operational risk reduction and demonstration activities to evaluate and validate the technical feasibility and proof-of-design of the target replacement system for the Mission Computer. This program element may include necessary civilian pay expenses required to manage, execute, and deliver CD's weapon system capability. Continue program office and other related support and integration activities such as, but not limited to, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. ***FY 2022 Plans:*** Planned projects include completion of demonstration activities, execution of the Mission Computer replacement hardware and software development, system integration, and developmental testing. In addition, the Signal Processor, Radar Controller, Receiver-Exciter (SPARC/REX) Replacement requirements definition activities will occur, and design, system hardware and software development will commence. This program element may include necessary civilian pay expenses required to manage, execute, and deliver CD's weapon system capability. Continue program office and other related support and integration activities such as, but not limited to, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022: $15.844M decrease due to a planned ramp down beginning in 2022 after the ramp up to full development in 2021.			
Accomplishments/Planned Programs Subtotals	-	28.179	12.292

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

The ADPE Rehost acquisition strategy will transition from Middle Tier Acquisition, under a DIU OTA, to traditional acquisition delivery orders under the COBRA DANE Re-compete Contract (CDRC). This approach will provide a phased extension of system service life to ensure warfighter capability through at least 2030. This evolutionary migration to a modernized open system approach provides the foundation for adaptable system sustainment and addition of future capabilities.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203873SF / *Ballistic Missile Defense Radars*	Project (Number/Name) 674820 / *Sensor Development*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
ADPE Phase II, Mission Computer replacement	SS/CPAF	Not specified. : TBD	-	-		24.478	Jun 2021	3.194	Feb 2022	-		3.194	-	-	-
Signal Processor, Radar Controller, Receiver-Exciter Replacement	SS/CPAF	Not specified. : TBD	-	-		-		6.270	Feb 2022	-		6.270	-	-	-
		Subtotal	-	-		24.478		9.464		-		9.464	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Platform one	Various	Platform One PMO : TBD	-	-		0.693	Apr 2021	0.529	Apr 2022	-		0.529	-	-	-
		Subtotal	-	-		0.693		0.529		-		0.529	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test and Evaluation	Various	Space Readiness Delta : TBD	-	-		0.825	Feb 2021	0.631	Feb 2022	-		0.631	-	-	-
		Subtotal	-	-		0.825		0.631		-		0.631	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Management Support	Various	Not specified. : TBD	-	-		2.183	Jun 2021	1.668	Jun 2022	-		1.668	-	-	-
		Subtotal	-	-		2.183		1.668		-		1.668	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203873SF / *Ballistic Missile Defense Radars*	Project (Number/Name) 674820 / *Sensor Development*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		28.179		12.292		-		12.292	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203873SF / *Ballistic Missile Defense Radars*	**Project (Number/Name)** 674820 / *Sensor Development*

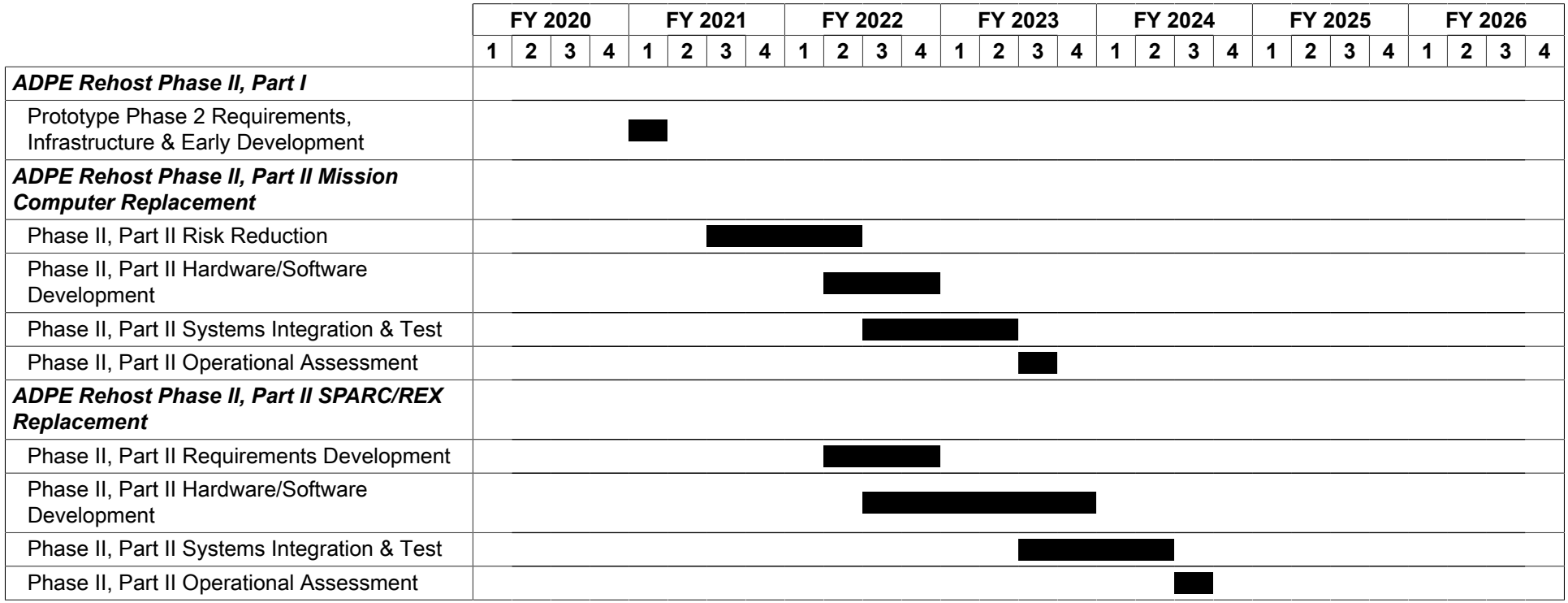

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203873SF / *Ballistic Missile Defense Radars*	**Project (Number/Name)** 674820 / *Sensor Development*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
ADPE Rehost Phase II, Part I				
Prototype Phase 2 Requirements, Infrastructure & Early Development	1	2021	1	2021
ADPE Rehost Phase II, Part II Mission Computer Replacement				
Phase II, Part II Risk Reduction	3	2021	2	2022
Phase II, Part II Hardware/Software Development	2	2022	4	2022
Phase II, Part II Systems Integration & Test	3	2022	2	2023
Phase II, Part II Operational Assessment	3	2023	3	2023
ADPE Rehost Phase II, Part II SPARC/REX Replacement				
Phase II, Part II Requirements Development	2	2022	4	2022
Phase II, Part II Hardware/Software Development	3	2022	4	2023
Phase II, Part II Systems Integration & Test	3	2023	2	2024
Phase II, Part II Operational Assessment	3	2024	3	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203906SF / *NCMC - TW/AA System*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	6.990	9.858	0.000	9.858	-	-	-	-	-	-
67A051: *Space Superiority - Advanced Intelligence Systems*	-	0.000	6.990	9.858	0.000	9.858	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2021, PE 1203906F, NCMC - TW/AA System, Project 67A051, Space Superiority - Advanced Intelligence Systems efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203906SF, NCMC - TW/AA System, Project 67A051, Space Superiority - Advanced Intelligence Systems from Appropriation 3600 per Congressional direction.

This program element supports development activities for the North American Aerospace Defense Command (NORAD) Cheyenne Mountain Complex (NCMC) - Integrated Tactical Warning Attack Assessment (ITW/AA) system that provides timely, unambiguous, and continuous warning and attack assessment of air, missile and space threats to North America, and geographical theaters. This system integrates and correlates missile launch and air surveillance information from certified sources to assess the nature of an enemy launch/attack and issue warnings to the President of the United States, Canadian National Leadership, United States Secretary of Defense, National Military Command Center and war-fighting Combatant Commanders. NCMC-ITW/AA and Legacy Space Command and Control (C2) systems provide NORAD/US Northern Command (USNORTHCOM), US Strategic Command (USSTRATCOM), and US Space Command (USSPACECOM) command structures with the information management, decision aids, and connectivity required to monitor, assess, plan, and execute assigned strategic, space operations, and missile defense missions. It provides Nuclear C2 and detonation detection.

The Combatant Commanders Integrated Command and Control System (CCIC2S) is a unique, integrated C2 "system of systems," providing data communication between external sensors and end users, mission processing for air and missile warning mission, and system operations functions. The system supports national strategic objectives with ITW/AA and provides missile and air warning, cueing, and engagement information to theater combatant commanders. The system consists of terrestrial and space-based sensor outputs, C2 nodes, and communications and dissemination links, connecting the US and Canadian defense information networks.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/ classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver NCMC-ITW/AA's weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203906SF *I NCMC - TW/AA System*

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	6.990	9.858	0.000	9.858
Total Adjustments	0.000	6.990	9.858	0.000	9.858
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	6.990			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	9.858	0.000	9.858

Change Summary Explanation

In FY 2021, PE 1203906F, NCMC - TW/AA System, Project 67A051, Space Superiority - Advanced Intelligence Systems efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203906SF, NCMC - TW/AA System, Project 67A051, Space Superiority - Advanced Intelligence Systems from Appropriation 3600 per Congressional direction.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: ITW/AA C2 Integration of C2BMC Feeds	-	6.990	9.858
Description: Obtain and assess non-ITW/AA (Global Data Integration) and non-traditional data sources (Command and Control, Battle Management, and Communications (C2BMC) and theater) for integration into CCIC2S and Processing and Display System Migration (PDSM) to display a more complete event picture. Improve source data accuracy for missile warning mission and translate for integration into CCIC2S that will enhance mission displays and improve impact prediction. Create multiple display options for the operator and reduce ambiguity between missile defense and missile warning displays. Provide program office support and other related support activities, including but not limited to technical analysis, prototyping, user evaluations, and independent certification testing.			
FY 2021 Plans: Funds the integration, processing and display of high fidelity data from non-ITW/AA and non-traditional sensors sources, resolving ambiguity and improving prediction accuracy, thus increasing the National Command Authorities' time-critical nuclear response			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203906SF *I NCMC - TW/AA System*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
decision space. Addresses emergent missile threats and other capability gaps identified in the Global Threat Characterization Assessment recommendations. Integrates missile defense and missile warning information supporting a common operating picture. Harmonizes the displays between Strategic Missile Warning, Theater Missile Warning, and Missile Defense. Integrates non-traditional source data to provide seamless event tracking and a common operating picture. Begin to leverage/integrate new data sources that come online and correlate with missile defense and missile warning display changes to meet emerging adversary threats. ***FY 2022 Plans:*** Continue integration, processing, and display of high fidelity data from non-ITW/AA and non-traditional sensors sources, ambiguity resolution, and prediction accuracy improvement to increase the National Command Authorities' time-critical nuclear response decision space. Continue to address emergent missile threats and other capability gaps identified in the Global Threat Characterization Assessment recommendations. Continue missile defense and missile warning information integration to support a common operating picture. Continue harmonization of displays between Strategic Missile Warning, Theater Missile Warning, and Missile Defense, and non-traditional source data integration to provide a seamless event-tracking and common operating picture. Continue to leverage/integrate new data sources that come online and correlate with missile defense and missile warning display changes to meet emerging adversary threats. Continue program office support and other related support activities, including but not limited to technical analysis, prototyping, user evaluations, and independent certification testing. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022: $2.902M increase due to ongoing, parallel efforts throughout the year, including CCIC2S Data Integration, C2BMC connectivity, and C2BMC user and display harmonization efforts.			
Accomplishments/Planned Programs Subtotals	-	6.990	9.858

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203906SF *I NCMC - TW/AA System*

E. Acquisition Strategy

The effort will be competitively awarded from an existing software services Indefinite Delivery/Indefinite Quantity (IDIQ) contract in Q4 FY 2021. This effort will provide incremental deliveries to the ITW/AA sustainment provider for incorporation into the operational system over two years.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203906SF / *NCMC - TW/AA System*	**Project (Number/Name)** 67A051 / *Space Superiority - Advanced Intelligence Systems*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Product Development of ITW/AA C2 Integration of C2BMC Feeds	C/CPIF	TBD : TBD, CO	-	-		6.490	Jul 2021	9.198	Jan 2022	-		9.198	-	-	-
		Subtotal	-	-		6.490		9.198		-		9.198	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Program Office Support	C/CPIF	A&AS : Colorado Springs, CO	-	-		0.500	Jul 2021	0.660	Jan 2022	-		0.660	-	-	-
		Subtotal	-	-		0.500		0.660		-		0.660	-	-	N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		6.990		9.858		-		9.858	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203906SF / *NCMC - TW/AA System*	**Project (Number/Name)** 67A051 / *Space Superiority - Advanced Intelligence Systems*

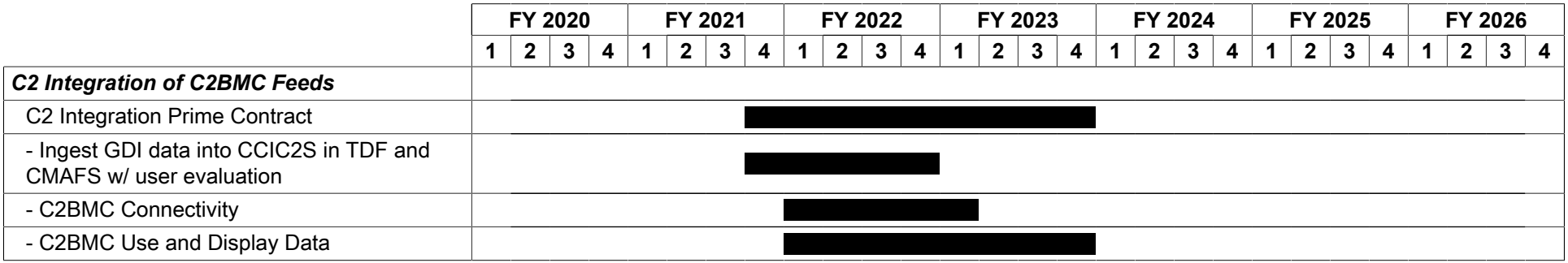

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203906SF / *NCMC - TW/AA System*	**Project (Number/Name)** 67A051 / *Space Superiority - Advanced Intelligence Systems*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
C2 Integration of C2BMC Feeds				
C2 Integration Prime Contract	4	2021	4	2023
- Ingest GDI data into CCIC2S in TDF and CMAFS w/ user evaluation	4	2021	4	2022
- C2BMC Connectivity	1	2022	1	2023
- C2BMC Use and Display Data	1	2022	4	2023

Note

In FY 2022, these efforts will continue from a previously awarded contract modification to an existing software services Indefinite Delivery/Indefinite Quantity (IDIQ) contract

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203913SF *I NUDET Detection System (SPACE)*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	0.000	29.157	45.887	0.000	45.887	-	-	-	-	-	-
672808: *Nuc Detonation Det Sys (sensors)*	-	0.000	29.157	45.887	0.000	45.887	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This program, BA 7, PE 1203913SF, project 672808, ICADS 7, is a new start.

A. Mission Description and Budget Item Justification

The United States Nuclear Detonation (NUDET) Detection System (USNDS) provides a near real-time worldwide, highly survivable/endurable capability to detect, locate, and report any nuclear detonations in the earth's atmosphere or in near space. USNDS supports NUDET detection requirements across five mission areas: Integrated Tactical Warning and Attack Assessment (ITW/AA), Nuclear Force Management (NFM), Space Control (SC), Treaty Monitoring (TM), and a classified mission.

The USNDS program is jointly sponsored and funded by the Department of Defense (DoD), through the Space Force, and the Department of Energy (DOE), through the National Nuclear Security Administration (NNSA) and its Nuclear Detonation Detection (NA-22) office, respectively. NNSA/NA-22 supplies USNDS space sensors as Government Furnished Equipment (GFE) to the Space Force's USNDS Program Office, which is responsible for all acquisition and Systems Engineering, Integration and Test (SEI&T) activities on Space Vehicles (SVs), to include Global Positioning System (GPS) and additional hosts, and their supporting ground control segments. The AF directly funds the development of the USNDS ground segment (described below).

DoD funds their contribution to the USNDS program in Program Element (PE) 1203913SF with Research, Development, Test and Evaluation, Space Force (RDT&E, SF), Procurement, Space Force (PSF), and Operations and Maintenance (O&M).

USNDS consists of space sensors and complex ground segments. The space segment sensors, funded by DOE, consists of three nuclear detection sensor payloads: the Radiation Detection Capability (RADEC) payload for Defense Support Program (DSP) satellites, the Global Burst Detection (GBD) payload for Medium Earth Orbit (MEO) platforms (GPS satellites), and the Space Atmospheric Burst Reporting System (SABRS) payload for Geosynchronous Earth Orbit (GEO) platforms (classified GEO host), and Space Test Platform (STP) 3. Together, these sensors and associated communications capability provided by the host satellites comprise the global NUDET space segment detection capability for the USNDS. Space sensors communicate NUDET indications to the fixed ground segment, the RADEC Data Processor (RDP), and the Integrated Correlation and Display System (ICADS), the five deployable mobile ground segment survivable Ground Nuclear Detonation Detection System Terminals (GNTs), and the survivable/endurable Universal Ground NDS Terminals (UGNTs), when operationally accepted in 4th Quarter of FY 2023. The ground segment provides ground receiving analysis and reporting capabilities to national authorities, commands, and forward users as well as Department of State (DOS) for the Treaty Monitoring and Verification mission. The ground control segment is being modernized and continuously improved through an incremental, evolutionary acquisition approach.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203913SF / *NUDET Detection System (SPACE)*

The upgrades to the GNTs are the survivable/endurable UGNT which are funded with RDT&E in this PE. The UGNT provides NUDET Detection Reports to end users through survivable/endurable USNDS communications via MilStar/Future Communication Systems (FCS)/Advanced Extremely High Frequency (AEHF) circuits. The GNT supports ITW/AA and NFM missions. The UGNT program modifies the baseline of the GNT program and deploys as an integral part of the Space Based Infrared System Survivable (SBIRS) / Endurable Evolution (S2E2) Mobile Ground System (SMGS) units also in support of ITW/AA and NFM. The UGNT, when integrated with the SMGS, will perform NUDET event processing with fused NDS data from GPS and DSP. SMGS capability refers to the result of the S2E2 upgrade program for the Mobile Ground System (MGS) mission processing capability, including the integration of UGNT. The intended end state of UGNT integration is delivery of enhanced NUDET detection capabilities which meet survivable/ endurable attack assessment requirements directed by the President, Secretary of Defense (SECDEF), Joint Staff, USSPACECOM, and USSTRATCOM, delivering long-term, cost effective, multi-role, multi-mission space effects to the war fighter across the range of military operations.

ICADS 7 will upgrade the ICADS 6 baseline to process new GBD IIIF NDS messages, address technology obsolescence, and meet updated cybersecurity requirements.

This budget line includes systems engineering, research and development, on-orbit and field testing and end-to-end verification of USNDS space sensors, ground analysis and reporting systems in support of the five USNDS mission areas. Sensor integration for GPS III and GPS IIIF are funded in their respective PEs.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This PE may include necessary civilian pay expenses required to manage, execute, and deliver NUDET Detection System (SPACE) weapon system capability. The use of such program funds is in addition to the civilian pay expenses budgeted in PEs 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203913SF *I NUDET Detection System (SPACE)*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	29.157	25.456	0.000	25.456
Current President's Budget	0.000	29.157	45.887	0.000	45.887
Total Adjustments	0.000	0.000	20.431	0.000	20.431
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	20.431	0.000	20.431

Change Summary Explanation

FY 2022: +$29.000M to develop ICADS 7; -$8.000M reduction for SABRS to USAF PE.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Integration with SBIRS S2E2 Mobile Ground Terminals (SMGTs) and On-orbit support	-	14.157	6.600

Description: Support the Integration and test activities between UGNTs and the S2E2 SMGTs, which together provide NUDET Detection Reports and missile warning data to end users through survivable/endurable USNDS communications via MilStar/ FCS/AEHF circuits. The UGNTs deploy as an integral part of the SBIRS S2E2 SMGS units also in support of ITW/AA and NFM. Support program scope analyzation for USNDS receiver and NUDET Decryption Unit (NDU) components. Additional support costs includes such activities as; receiver system engineering support, on-orbit NDS sensor integration, conceptual hardware and software design, check-out/support, testing, and system engineering.

FY 2021 Plans:

Preparation and execution of FPAK operational testing and evaluation (OT&E). Support US Space Force Headquarters (USSF HQ) Operational Acceptance (OA) and Initial Operational Capability (IOC) decisions. Respond to tasks/RFIs and plan additional testing to ensure USSF HQ has the required information to approve OA and IOC. Support the operational Trial Period (TP). Respond to unit Technical Assists (TA), Emergency Depot Level Maintenance (EDLM), Urgent Depot Level Maintenance (UDLM) as required to ensure TP success. Supported optical algorithm study, system readiness review, material development preparation, Hard Radiation System (HRS), Electromagnetic Pulse (EMP) and Spectral Imaging Geolocation Hyper-Temporal Sensor (SIGHTS) telemetry definitions. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.

FY 2022 Plans:

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203913SF *I NUDET Detection System (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Continue to support S2E2 integration and testing activities due to UGNT CONOPS change. Funds are required to support additional integration activities between the Universal Ground NDS Terminals (UGNT) and developing SBIRS Mobile Ground Terminals (SMGT). The additional integration activities will mitigate technical and schedule inefficiencies due to a shift in the S2E2 CONOPS. Important activities include execution for UGNT dry runs, run for record, operational test and evaluation and software updates for maintaining an accredited cybersecurity posture. Funds will also provide extended Interim Contract Support (ICS) as a direct result of the new CONOPS shift for the survivable and endurable mission. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021.Continue funding UGNT integration with SBIRS S2E2 Mobile Ground Terminals activities.			
Title: SABRS Integration ***Description:*** Classified Integration efforts of SABRS and existing USNDS ground systems. ***FY 2021 Plans:*** Classified ***FY 2022 Plans:*** Classified ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021. Continue classified effort of SABRS integration.	-	15.000	3.000
Title: ICADS 7 ***Description:*** ICADS 7 consists of satellite ground data processing systems that accommodate the new NDS payload on GPS IIIF family of vehicles and is an upgrade to the current ICADS 6 system. ICADS 7 includes new software, hardware and cybersecurity capabilities and NDS Analysis Package Ground Station (NAPGS) ground systems. The effort includes, but not limited to, the upgrade of two new ICADS 7 test beds and the replacement of the NUDET Decryption Unit (NDU), Enhanced Receiver Subsystems (ERS), and Automated Data Processors (ADP). A non-recurring Engineering (NRE) effort is required to design the replacements for the NDUs, ERSs and ADPs currently on NDS tests beds and fielded systems. ICADS upgrade includes data processing changes to support the new NDS optical sensor, known as Spectral Imaging Geolocation Hyper-Temporal Sensor (SIGHTS), that will be hosted on the GPS IIIF satellite vehicles. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:***	-	0.000	36.287

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203913SF *I NUDET Detection System (SPACE)*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Begin ICADS 7 development including, but not limited to initial design, development of the NDU and ERS, new algorithms, and upgrade software and hardware to support the USNDS payload on GPS IIIF. ICADS 7 activities also include systems engineering, program support, initial test planning, and finalizing requirements. ICADS ground system updates to command and control NDS payloads, data acquisition, telemetry extraction, mission data processing, and data distribution for NDS sensor payloads. ICADS 7 development includes GPS IIIF Mission Readiness Campaign (MRC) space segment test support, GPS IIIF Early Integration, on-orbit sensor integration, Functional Configuration Audit/ Physical Configuration Audit (FCA/PCA) and Development, Testing and Evaluation (DT&E) requirements. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to, program office support, studies, technical analysis, experimentation, prototyping etc. ICADS 7 will complete System Requirements Review (SRR) in the 3rd quarter of 2022. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021. ICADS 7 is a new start.			
Accomplishments/Planned Programs Subtotals	-	29.157	45.887

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• SPSF 01 01 Space Force NUDETS: *Nudet Detection Space*	-	6.638	6.690	0.000	6.690	-	-	-	-	-	-

Remarks

E. Acquisition Strategy

The USNDS Acquisition Strategy is to develop, integrate, field and sustain USNDS satellite sensors and USNDS ground data processing and distribution hardware and software as well as mission operational and technical program support to sustain the USNDS capability on GPS, DSP, Alternate Host, and SBIRS; funding is sent by Military Interdepartmental Purchase Request (MIPR) from DoD and DOE to Sandia, Los Alamos National Laboratories and other agencies on existing DOE/NNSA contracts. The ICADS 7 Acquisition Strategy is currently under review and is estimated to complete in 3rd Quarter FY 2021 to support planned contract award in January 2022. USNDS requirements are defined in the Operational Requirements Document (ORD) dated 21 Jan 04.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203913SF / *NUDET Detection System (SPACE)*	Project (Number/Name) 672808 / *Nuc Detonation Det Sys (sensors)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
USNDS ICADS, GNT/ UGNT, and Integration Support	MIPR	Sandia National Laboratory : Albuquerque, NM	-	-		4.514	Nov 2020	6.600	Nov 2021	-		6.600	-	-	-
USNDS Technical Mission Analysis	RO	Aerospace : El Segundo, CA	-	-		0.846	Dec 2020	0.871	Nov 2021	-		0.871	-	-	-
USNDS Enterprise SE&I	Various	TASC : El Segundo, CA	-	-		0.903	Dec 2020	0.820	Nov 2021	-		0.820	-	-	-
Classified Development	TBD	Classified : Classified	-	-		15.000	Jan 2021	3.000	Nov 2021	-		3.000	-	-	-
ICADS 7	MIPR	Sandia National Laboratory : Albuquerque, NM	-	-		-		25.554	Jan 2022	-		25.554	-	-	-
		Subtotal	-	-		21.263		36.845		-		36.845	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
USNDS Testing	Various	17th Test Squadron, JITC : Schriever SFB, CO	-	-		0.148	Dec 2020	0.217	Dec 2021	-		0.217	-	-	-
USNDS On-orbit Sensor Testing	MIPR	Various : LANL, SNL, NM	-	-		4.669	Dec 2020	5.361	Dec 2021	-		5.361	-	-	-
		Subtotal	-	-		4.817		5.578		-		5.578	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
USNDS FFRDC	RO	Aerospace, MITRE : El Segundo, CA	-	-		0.363	Dec 2020	0.373	Nov 2021	-		0.373	-	-	-
USNDS A&AS	Various	Various : Various	-	-		2.634	Nov 2020	3.011	Nov 2021	-		3.011	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203913SF / *NUDET Detection System (SPACE)*	Project (Number/Name) 672808 / *Nuc Detonation Det Sys (sensors)*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
USNDS Other Support	Various	Various : Various	-	-		0.080	Nov 2020	0.080	Nov 2021	-		0.080	-	-	-
		Subtotal	-	-		3.077		3.464		-		3.464	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		29.157		45.887		-		45.887	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203913SF / *NUDET Detection System (SPACE)*	**Project (Number/Name)** 672808 / *Nuc Detonation Det Sys (sensors)*

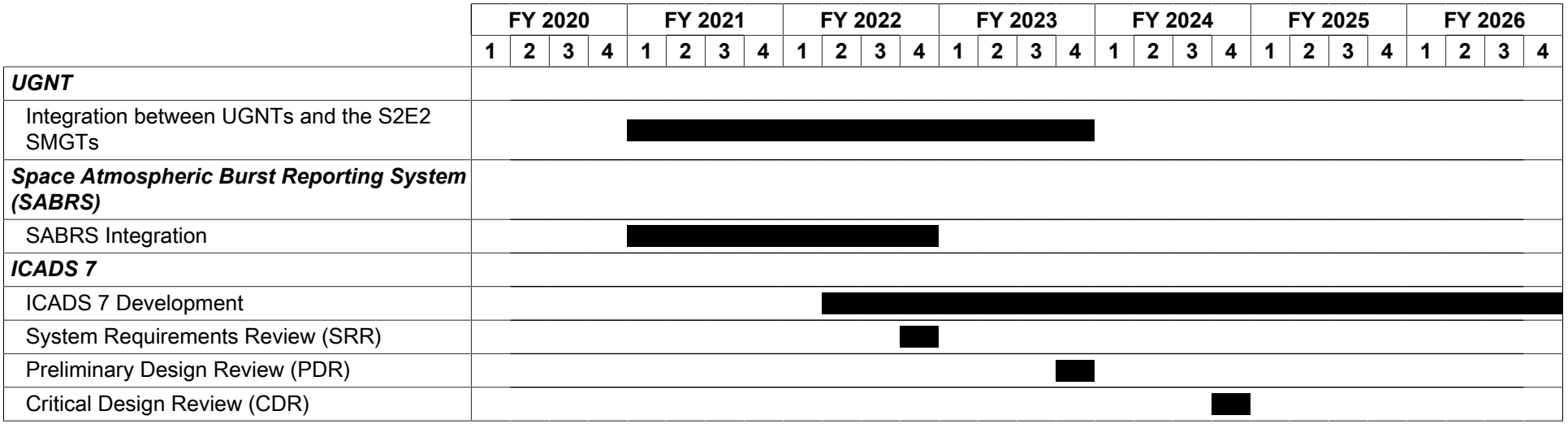

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203913SF / *NUDET Detection System (SPACE)*	**Project (Number/Name)** 672808 / *Nuc Detonation Det Sys (sensors)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
UGNT				
Integration between UGNTs and the S2E2 SMGTs	1	2021	4	2023
Space Atmospheric Burst Reporting System (SABRS)				
SABRS Integration	1	2021	4	2022
ICADS 7				
ICADS 7 Development	2	2022	4	2026
System Requirements Review (SRR)	4	2022	4	2022
Preliminary Design Review (PDR)	4	2023	4	2023
Critical Design Review (CDR)	4	2024	4	2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203940SF / *Space Situation Awareness Operations*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	69.809	64.763	0.000	64.763	-	-	-	-	-	-
673940: *Space Data Fusion*	-	0.000	0.000	64.763	0.000	64.763	-	-	-	-	-	-
67A017: *Sensor Service Life Extension Program*	-	0.000	69.809	0.000	0.000	0.000	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

In FY 2022, PE 1203940F, Space Situation Awareness Operations, Project 67A017, Sensor Service Life Extension Program efforts were transferred to Project 673940, Space Data Fusion in order to better describe the work being performed.

Space Domain Awareness (SDA) is one of five core competencies of the Space Force and is the effective identification, characterization, and understanding of any factor, passive or active, associated with the space domain that could affect space operations and thereby impact the security, safety, economy, or environment of our nation. As the foundation for space control, SDA encompasses surveillance of all space objects and activities; detailed surveillance of specific space assets; monitoring space environmental conditions; monitoring cooperative space assets; gathering indications and warning on adversary space operations; and conducting integrated command, control, communications, processing, analysis, dissemination, and archiving activities.

This program element fields, upgrades, operationalizes, operates, and maintains Space Force sensors and information/data integration capabilities within the SDA network while companion program element 1206425SF, Space Situational Awareness Systems, develops new network sensors and associated information integration capabilities across the network. Activities funded in this program element (1203940SF) focus on surveillance of objects in earth orbit to aid tasks including satellite tracking; space object identification; tracking and cataloging; satellite attack warning; notification of satellite flyovers to U.S. forces; space treaty monitoring; and technical intelligence gathering. As a whole, this program upgrades, modifies, modernizes, operationalizes, fields, operates, and maintains sensors and information integration capabilities for an integrated, end-to-end SDA architecture that provides critical national security space solutions on tactical operational timelines.

The Space Data Fusion project (673940) develops and/or upgrades SDA data/data exploitation capabilities, provides Service Life Extension Programs (SLEPs) and pre-planned product improvement efforts to operational SDA capability. This project includes Global Sensor Watch (GSW), Unified Data Library (UDL), and Space Surveillance Telescope (SST) efforts that support the SDA activities outlined above.

The Sensor SLEP project (67A017) includes efforts to upgrade, operationalize, and extend the life of operational SDA sensors and to develop and expand SDA data/ data exploitation capability. SLEPs extend the serviceable life of assets and maintain critical capability by replacing aging and increasingly unsustainable components with modern and sustainable equipment. Sensor SLEP efforts may include SDA sensor, SDA communications, and SDA data/data exploitation, prototyping and technology demonstrations.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awareness Operations*

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	44.809	58.968	0.000	58.968
Current President's Budget	0.000	69.809	64.763	0.000	64.763
Total Adjustments	0.000	25.000	5.795	0.000	5.795
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	25.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	5.795	0.000	5.795

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 67A017: *Sensor Service Life Extension Program*		
Congressional Add: *Commercial Space Domain Awareness*	-	25.000
Congressional Add Subtotals for Project: 67A017	-	25.000
Congressional Add Totals for all Projects	-	25.000

Change Summary Explanation

FY 2022: +$6.019 including +$6.598M for extension of secure space data sharing and fusion efforts, including establishing interconnectivity with Japan-US Space Operations Centers and scaling Unified Data Library, and -$0.803M for inflation.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203940SF / *Space Situation Awarenes s Operations*	Project (Number/Name) 673940 / *Space Data Fusion*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
673940: *Space Data Fusion*	-	0.000	0.000	64.763	0.000	64.763	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2022, PE 1203940F, Space Situation Awareness Operations, Project 67A017, Sensor Service Life Extension Program efforts were transferred to Project 673940, Space Data Fusion to more accurately describe the work being performed. Project 67A017 included Global Sensor Watch (GSW) and Space Surveillance Telescope (SST) major thrusts. Both of these efforts were transferred to 673940 with the addition of a new major thrust, Unified Data Library (UDL), previously conducted under the GSW major thrust. UDL was separated to provide additional clarity on UDL and commercial SDA efforts.

GSW provides an integrated, end-to-end, SDA tip & cue capability that implements a survivable architecture providing overlapping, assured, and viable surveillance options for executing event response, SDA data processing at multiple classification levels, and automated, worldwide, cross-sensor tipping & cueing. Efforts directly enable support for Space Command & Control (C2) by developing & deploying advanced software algorithms to identify, acquire, characterize, and maintain custody of both space objects of interest and new foreign launches; developing & deploying advanced data analytics, machine learning, & artificial intelligence capabilities for rapid indication & warning; enhancing space environmental monitoring solutions; integrating and optimizing access to coalition, commercial, academic, intelligence community (IC) & Missile Defense Agency sensors to better support the broader space enterprise; supporting USSPACECOM operations and training exercises; leading trials, testing and training campaigns to test & optimize capabilities in support of the broader space kill chain; enhancing sensor performance to close the solar exclusion gap by leveraging modern technology and commercial & IC sensors for greater space domain coverage; and improving legacy communication paths to enable a more complete space enterprise capability.

The Space Data Fusion effort develops the UDL to support integration, exploitation and delivery of SDA data sources for C2 and battle management of space forces. It focuses on enabling data sharing, establishing the data architecture required to aggregate multi-sensor data for broader use at different clearance levels, transforming any-source data into normalized, usable information via data exploitation tools, followed by data hand off to Battle Management Command and Control mission systems to support actual space operations. Space Data Fusion/UDL efforts include purchasing commercial SDA data and services in support of US Space Command (USSPACECOM) operations. This program is complementary and performed in parallel with program PE 1206425SF, Space Situational Awareness Systems, which develops new network sensors and improved information integration capabilities across the network.

The Space Surveillance Telescope (SST) provides rapid un-cued search, detection and tracking of dim objects in deep space, collecting data on all viewable objects in the Indio-Pacific region. As a combined program with Australia's Department of Defense, per the 2013 US Secretary of Defense (USSECDEF) and the Australian Defence Minister (AUSMINDEF) SST Partnership Memorandum of Understanding (MOU), SST improves detection and characterization of friendly and enemy military space activities; improves orbital safety of flight during maneuver, separation, conjunction assessment, and proximity operations; and improves support to defensive and offensive counterspace operations.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awareness Operations*	**Project (Number/Name)** 673940 / *Space Data Fusion*

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Global Sensor Watch (GSW)	-	0.000	45.904

Description: GSW provides an integrated SDA architecture to deliver a resilient, high capacity, sensitive, timely, and comprehensive global ground and space-based network of sensors that cover the geocentric and cislunar orbital regimes. GSW is a survivable, automated cross-sensor tip and cue capability that provides overlapping, assured, and viable surveillance options for executing event response, and SDA data processing at multiple classification levels. In order to ensure the successful implementation of a survivable, overlapping, assured, and viable architecture, GSW includes the necessary sensor communication upgrades to ensure data transport/throughput, compatibility, and effects-based tactical tasking/response functionality. To do this, GSW enables highly available, non-stovepiped sensor planning, tasking, response, and data collection, as well as processed information/products/results to be stored, shared, and integrated for warfighting and analysis.

GSW will continue coordination with Japanese Ministry of Defense (JMOD) on the development of classified C2 and SDA data sharing between a Japanese Space Operations Center (SpOC) and the U.S. Combined Space Operations Center (CSpOC). This will align Japanese sensors and United States Government (USG) and non-USG assets to provide critical national security space solutions on tactical operational timelines.

FY 2021 Plans:
N/A

FY 2022 Plans:
GSW will upgrade sensor communications to existing systems, including radar sites at Eglin Air Force Base, Florida, and the Ground-Based Radar in Kwajalein (GBR-K), to facilitate GSW tip and cue operations. Modernize legacy sensor message formats and protocols for greater accuracy; support USSPACECOM operations and test activities to vet new SDA capability deliveries and concepts of operations for optimizing legacy SDA sensors operations; establish a SDA tip and cue sensor test asset; continue

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 673940 / *Space Data Fusion*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
integration of GSW tip and cue software at existing radar sites; continue automation of manual SDA processes; develop classified C2 and SDA sharing with Japanese Space Operations Center (JSpOC); align USG and non-USG assets to provide critical national security space solutions on tactical operational timelines; and accomplish satellite tracking, space object identification (SOI), tracking, and cataloging of data collected from Japanese assets. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to transfer of funding from Space Sensor Life Extension Program (SLEP) Project to new Space Data Fusion Project for transparency.			
Title: Space Data Fusion/Unified Data Library (UDL)	-	0.000	17.059
Description: Space Data Fusion develops Unified Data Library (UDL) capabilities to support integration, exploitation, and delivery of data sources for command and control and battle management of space forces. UDL will continue to develop the library by onboarding new data sets, expand data services, expand defensive cyber operations capabilities, add non-metric data to the SDA marketplace, continue to expand local area network capability to share Space Surveillance Network (SSN) data in a cyber-secure manner, and purchase commercial data and services to support USSPACECOM operations, allow optimized data flow for use of existing SDA capability, and provide access to new commercial SDA innovations that will enable the broader SDA mission. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** Expand UDL infrastructure to support increased number of customers and operations across multiple security environments by initiating an Enterprise Support structure that allows for the UDL to be "franchised" and proliferated at different classification levels, yet still supported by a common source of system administration for all UDL instances located at any classification level. Will purchase commercial data to support SDA marketplace and provide limited resources to procure commercial SDA services. All commercial SDA related funding will result in the timely provision of accurate data and information to government customers. Will fund expansion of defensive cyber operations capability, to include persistent red team analysis of broader UDL architecture. Overall, funds cover cloud hosting cost, data service development, security, system administration, data on boarding, US Space Force related exercise support, cross domain solution services and integration of the legacy communications architecture with the UDL. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 673940 / *Space Data Fusion*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of C2, resiliency measures and mission partner interfaces, space test/combat range events, and office support etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021. These efforts were previously conducted within the GSW major thrust, but were separated to clearly outline UDL and commercial SDA activities.			
Title: Space Surveillance Telescope (SST) ***Description:*** Space Surveillance Telescope (SST) provides rapid un-cued search, detection, and tracking of dim objects in deep space, collecting data on all viewable objects in the Indo-Pacific region. As a combined program with Australia's Department of Defence, per the 2013 USSECDEF and AUSMINDEF SST Partnership MOU, SST improves detection and characterization of friendly and enemy military space activities; improves orbital safety of flight during maneuver, separation, conjunction assessment, and proximity operations; and improves support to defensive and offensive counterspace operations addressing critical space domain awareness gaps. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** Complete SST Developmental/Operational Test and Evaluation (DT&E/OT&E), complete Space Force Operational Acceptance process, and support Australian Defence testing efforts for joint Initial Operational Capability (IOC)/Full Operational Capability (FOC) declaration. Continue program office and other related support and integration activities such as, but not limited to, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to transfer of funding from Space Sensor Life Extension Program (SLEP) Project to new Space Data Fusion Project for transparency. Completion of this project is planned for FY 2022.	-	0.000	1.800
Accomplishments/Planned Programs Subtotals	-	0.000	64.763

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 673940 / *Space Data Fusion*

D. Acquisition Strategy

The acquisition strategies for GSW, UDL, and SST include a mix of modifications to existing Air Force or Space Force contracts and directing funds to other Air Force, Space Force, or DoD organizations for contract support. In addition, UDL acquisition strategy will include contracts with commercial providers to source data through a SDA marketplace to allow delivery of needed and timely data.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203940SF / *Space Situation Awarenes s Operations*	Project (Number/Name) 673940 / *Space Data Fusion*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GSW Exploitation	Various	MIT/LL : Lexington, MA	-	-		-		10.750	Nov 2021	-		10.750	-	-	-
GSW Dynamic Tasking	Various	Various : TBD	-	-		-		8.218	Dec 2021	-		8.218	-	-	-
GSW Sensor Comm Upgrades	Various	Various : TBD	-	-		-		18.891	Mar 2022	-		18.891	-	-	-
GSW SW Development 3	Various	Sandia National Labs : Albuquerque, NM	-	-		-		1.000	Nov 2021	-		1.000	-	-	-
UDL Data Science WG	C/CPFF	L3Harris : Colorado Springs, CO	-	-		-		0.566	Jan 2022	-		0.566	-	-	-
UDL Commercial Data	C/CPFF	Various : TBD	-	-		-		3.000	Jan 2022	-		3.000	-	-	-
UDL Development/Data Onboarding	Various	Various : TBD	-	-		-		4.821	Dec 2021	-		4.821	-	-	-
UDL Cloud Hosting	Various	Various : TBD	-	-		-		6.294	Mar 2022	-		6.294	-	-	-
Space Surveillance Telescope	Various	Various : Exmouth, Australia	-	-		-		1.800	Oct 2021	-		1.800	-	-	-
		Subtotal	-	-		-		55.340		-		55.340	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Allot	Various : Colorado Springs, CO	-	-		-		4.357	Dec 2021	-		4.357	-	-	-
FFRDC	RO	Various : Colorado Springs, CO	-	-		-		4.766	Nov 2021	-		4.766	-	-	-
Other Support	Various	Various : Colorado Springs, CO	-	-		-		0.300	Dec 2021	-		0.300	-	-	-
		Subtotal	-	-		-		9.423		-		9.423	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203940SF / *Space Situation Awarenes s Operations*	Project (Number/Name) 673940 / *Space Data Fusion*	

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		0.000		64.763		-		64.763	-	-	N/A

Remarks

The Space Data Fusion project has minimal organic resources. The FY 2022 increase in Management Services is due to parallel efforts to expand UDL infrastructure; purchase commercial data; integrate commercial, allied, academic & SDA data sources into UDL; and establish secure connectivity between the US and Japanese Space Operations Centers.

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 673940 / *Space Data Fusion*

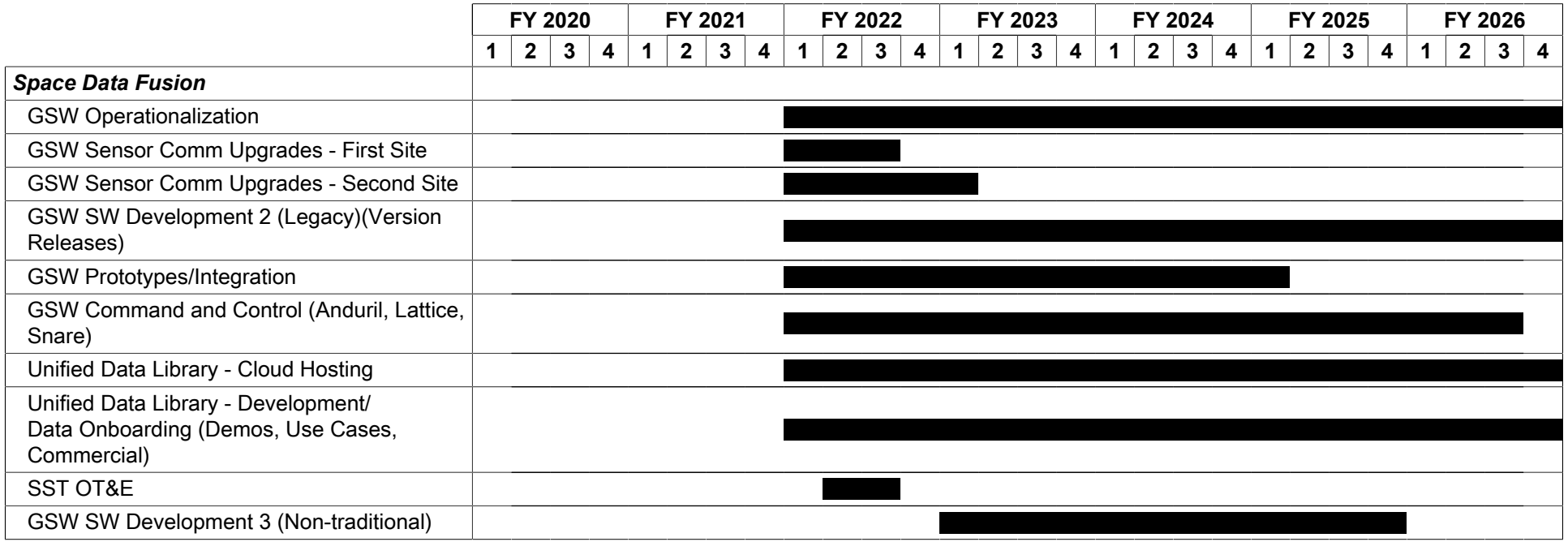

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 673940 / *Space Data Fusion*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Space Data Fusion				
GSW Operationalization	1	2022	4	2026
GSW Sensor Comm Upgrades - First Site	1	2022	3	2022
GSW Sensor Comm Upgrades - Second Site	1	2022	1	2023
GSW SW Development 2 (Legacy)(Version Releases)	1	2022	4	2026
GSW Prototypes/Integration	1	2022	1	2025
GSW Command and Control (Anduril, Lattice, Snare)	1	2022	3	2026
Unified Data Library - Cloud Hosting	1	2022	4	2026
Unified Data Library - Development/Data Onboarding (Demos, Use Cases, Commercial)	1	2022	4	2026
SST OT&E	2	2022	3	2022
GSW SW Development 3 (Non-traditional)	1	2023	4	2025

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1203940SF / *Space Situation Awareness Operations*	Project (Number/Name) 67A017 / *Sensor Service Life Extension Program*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
67A017: *Sensor Service Life Extension Program*	-	0.000	69.809	0.000	0.000	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

In FY 2022, PE 1203940F, Space Situation Awareness Operations, Project 67A017, Sensor Service Life Extension Program efforts were transferred to Project 673940, Space Data Fusion to more accurately describe the work being performed.

Service Life Extension Programs (SLEPs) are efforts to upgrade, operationalize and extend the life of operational SSA sensors. These SLEPs extend the serviceable life of assets and maintain critical capability by replacing aging and increasingly unsustainable components with modern and sustainable equipment. In addition, the SLEPs themselves may be designed to increase capabilities not currently realized. As the need arises in the execution year, funds in this project may be used to begin SLEPs on additional efforts. These efforts may include prototyping and technology demonstrations.

The Global Sensor Watch (GSW) effort provides an integrated, end-to-end SDA tip & cue capability that implements a survivable architecture providing overlapping, assured, and viable surveillance options for executing event response, SDA data processing at multiple classification levels, and automated, worldwide, cross-sensor tipping & cueing. Efforts directly enable support for Space Command & Control (C2) by developing & deploying advanced software algorithms to identify, acquire, characterize, and maintain custody of both space objects of interest and new foreign launches; developing & deploying advanced data analytics, machine learning, & artificial intelligence capabilities for rapid indication & warning; enhancing space environmental monitoring solutions; integrating and optimizing access to coalition, commercial, academic, intelligence community (IC) & Missile Defense Agency sensors to better support the broader space enterprise; supporting US Space Command (USSPACECOM) operations and training exercises; leading trials, testing and training campaigns to test & optimize capabilities in support of the broader space kill chain; enhancing sensor performance to close the solar exclusion gap by leveraging modern technology and commercial & IC sensors for greater space domain coverage; and improving legacy communication paths to enable a more complete space enterprise capability.

The Space Surveillance Telescope (SST) provides rapid un-cued search, detection and tracking of dim objects in deep space, collecting data on all viewable objects in the Indio-Pacific region. As a combined program with Australia's Department of Defense, per the 2013 US Secretary of Defense (USSECDEF) and the Australian Defence Minister (AUSMINDEF) SST Partnership Memorandum of Understanding (MOU), SST improves detection and characterization of friendly and enemy military space activities; improves orbital safety of flight during maneuver, separation, conjunction assessment, and proximity operations; and improves support to defensive and offensive counterspace operations.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 67A017 / *Sensor Service Life Extension Program*

authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver the weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Surveillance Telescope (SST) Developmental/Operational Test and Evaluation (DT&E/OT&E)	-	4.912	0.000
Description: Space Surveillance Telescope (SST) provides rapid un-cued search, detection and tracking of dim objects in deep space, collecting data on all viewable objects in the Indio-Pacific region. As a combined program with Australia's Department of Defense, per the 2013 USSECDEF and AUSMINDEF SST Partnership Memorandum of Understanding (MOU), SST improves detection and characterization of friendly and enemy military space activities; improves orbital safety of flight during maneuver, separation, conjunction assessment, and proximity operations; and improves support to defensive and offensive counterspace operations addressing critical space domain awareness gaps. ***FY 2021 Plans:*** Complete SST reassembly, subsystem integration, and testing, including facility integration, SST subsystem and system testing, and Developmental Testing/Operational Test & Evaluation (DT&E/OT&E). Space Acquisition must respond with speed and agility to emerging adversary threats. Space acquisition must respond with speed and agility to emerging adversary threats. Implement system resiliency and situational awareness necessary to operate in the contested space domain. RDT&E funding is required to support this transformation and enable Space Superiority end-to-end integration activities such as, but not limited to, program office support, studies, technical analysis, experimentation, prototyping, architectural development, systems engineering, demonstrations, testing, command and control integration, mission partner integration, and space test/combat range events. ***FY 2022 Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to transfer of funding from Space Sensor Life Extension Program (SLEP) Project to new Space Data Fusion Project for transparency.			
Title: Global Sensor Watch Program (GSW)	-	39.897	0.000
Description: GSW provides an integrated SDA architecture to deliver a resilient, high capacity, sensitive, timely, and			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 67A017 / *Sensor Service Life Extension Program*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
comprehensive global ground and space-based network of sensors that cover the geocentric and cislunar orbit regimes with a survivable tip & cue capability that provides overlapping, assured, and viable surveillance options for executing event response, processing of SDA data at multiple classification levels, and automated cross-sensor tipping & cueing worldwide. In order to ensure the successful implementation of a survivable, overlapping, assured, and viable architecture, GSW includes the necessary sensor comm upgrades to ensure data transport/throughput, compatibility, and effects-based tactical tasking/response functionality. To do this, GSW enables highly available, non-stovepipe sensor planning, sensor tasking, sensor response, collected sensor data, and processed information/products/results to be stored, shared, and integrated for warfighting and analysis. GSW will continue coordination with Japanese Ministry of Defense (JMOD) on the development of classified C2 and SDA data sharing between a Japanese Space Operations Center (SpOC) and Combined Space Operations Center (CSpOC). This will align Japanese sensors and United States Government (USG) and non-USG assets to provide critical national security space solutions on tactical operational timelines. ***FY 2021 Plans:*** Complete prime contractor testing. Conduct system training with RAAF Operators and Australian Level 1 maintainers. Accomplish DT&E and complete OT&E planning. Congressional add procures SSA data and services from commercial SSA providers. The data and services will be examined and technically evaluated for potential operational use. Datasets will be evaluated to determine if technically capable and viable to supplement the SSN. Services will provide tools for concept evaluation and technical analysis in coordination with SpOC to determine usability for the operational community. ***FY 2022 Plans:*** N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to transfer of funding from Space Sensor Life Extension Program (SLEP) Project to new Space Data Fusion Project for transparency.			
Accomplishments/Planned Programs Subtotals	-	44.809	0.000

	FY 2020	FY 2021
Congressional Add: Commercial Space Domain Awareness	-	25.000
FY 2021 Plans: The program office will execute funding through various existing and new contracts such as using the SDA Marketplace for data buys and associated services, procuring UDL enhancement and		

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 67A017 / *Sensor Service Life Extension Program*

	FY 2020	FY 2021
improvement on the ACCESS contract, and utilizing Small Business Innovative Research to evaluate emerging technical capability in the commercial space sector.		
Congressional Adds Subtotals	-	25.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Congressional add will be executed on a variety of new and existing contracts using competitive sources to the maximum amount possible, such as Automated Non-Traditional Data Validation efforts on the MOSSAIC contract, Commercial Services Onboarding on a new contract, Data Visualization Services on multiple existing contracts, data buys and associated services via the SDA Marketplace; UDL enhancement and improvement on the ACCESS contract, and utilizing Small Business Innovative Research to evaluate emerging technical capability in the commercial space sector.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 67A017 / *Sensor Service Life Extension Program*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GSW Operationalization	C/TBD	Multiple : Colorado Springs, CO	-	-		31.697	Dec 2020	-		-		-	-	-	-
GSW SW Development 1	Various	AFRL : TBD	-	-		2.750	Feb 2021	-		-		-	-	-	-
GSW SW Development 2	Various	MIT/LL : Lexington, MA	-	-		2.800	Jan 2021	-		-		-	-	-	-
GSW SW Development 3	Various	Sandia National Labs : Albuquerque, NM	-	-		0.600	Nov 2020	-		-		-	-	-	-
UDL Commercial Data	Various	Various : Various	-	-		25.000	Jul 2021	-		-		-	-	-	-
Space Surveillance Telescope	Various	Multiple : Exmouth Australia	-	-		4.912		-		-		-	-	-	-
		Subtotal	-	-		67.759		-		-		-	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	Various	Multiple : Colorado Springs, CO	-	-		1.200	Nov 2020	-		-		-	-	-	-
FFRDC	Various	Multiple : Colorado Springs, CO	-	-		0.700	Dec 2020	-		-		-	-	-	-
Other Support	Various	Multiple : Colorado Springs, CO	-	-		0.150	Nov 2020	-		-		-	-	-	-
		Subtotal	-	-		2.050		-		-		-	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		69.809		-		-		-	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 67A017 / *Sensor Service Life Extension Program*

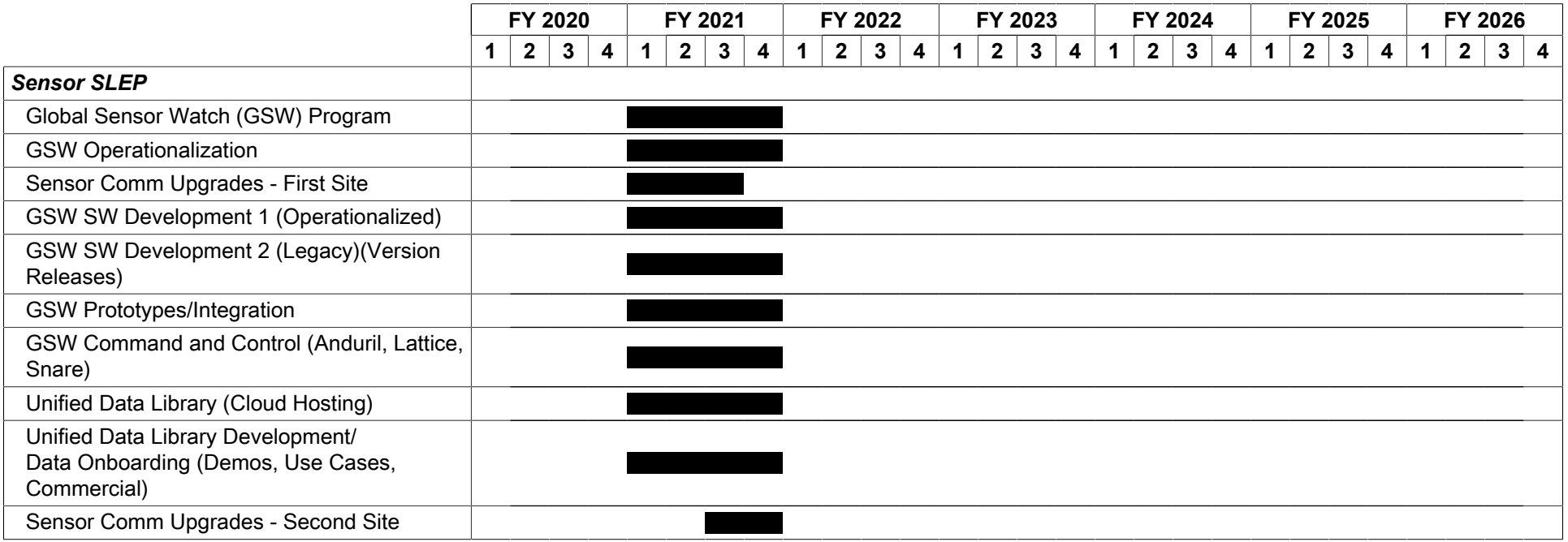

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1203940SF / *Space Situation Awarenes s Operations*	**Project (Number/Name)** 67A017 / *Sensor Service Life Extension Program*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Sensor SLEP				
Global Sensor Watch (GSW) Program	1	2021	4	2021
GSW Operationalization	1	2021	4	2021
Sensor Comm Upgrades - First Site	1	2021	3	2021
GSW SW Development 1 (Operationalized)	1	2021	4	2021
GSW SW Development 2 (Legacy)(Version Releases)	1	2021	4	2021
GSW Prototypes/Integration	1	2021	4	2021
GSW Command and Control (Anduril, Lattice, Snare)	1	2021	4	2021
Unified Data Library (Cloud Hosting)	1	2021	4	2021
Unified Data Library Development/Data Onboarding (Demos, Use Cases, Commercial)	1	2021	4	2021
Sensor Comm Upgrades - Second Site	3	2021	4	2021

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1206423SF *I Global Positioning System III - Operational Control Segment*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	0.000	481.999	413.766	0.000	413.766	-	-	-	-	-	-
67A021: *OCX*	0.000	0.000	421.664	357.577	0.000	357.577	-	-	-	-	-	-
67A025: *GPS Enterprise Integrator*	0.000	0.000	60.335	56.189	0.000	56.189	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

The Global Positioning System (GPS) is a space based Positioning, Navigation and Timing (PNT) distribution system which operates through all weather. GPS supports both civil and military users in air, space, sea and land operations. GPS is a satellite-based radio navigation system that serves military and civil users worldwide. GPS users process satellite signals to determine accurate position, velocity and time. GPS must comply with Title 10 United States Code (USC) Sec 2281 which requires that the Secretary of Defense (SECDEF) ensures the continued sustainment and operation of GPS for military and civilian purposes, and 51 USC Sec 50112, which requires that GPS complies with certain standards and facilitates international cooperation.

Program Element (PE) 1206423SF funds Research, Development, Test and Evaluation (RDT&E) for the GPS Next Generation Operational Control System (OCX), the upgrade to OCX called OCX Block 3F to incorporate Regional Military Protection (RMP), command and control functionality for GPS III Follow-on (GPS IIIF) satellites, and the GPS Enterprise Integrator (EI). OCX acquisition was established to 1) provide command and control of legacy and GPS III satellites, 2) incorporate situational awareness to support Navigation Warfare (NAVWAR) and signal monitoring, 3) enable mission capability upgrades to support a warfighter effects-based approach to operations, and 4) integrate Department of Defense (DoD) information assurance and cybersecurity controls and capabilities. OCX Block 3F will upgrade OCX with new capabilities to synchronizes with GPS IIIF Space Segment capabilities. GPS EI is responsible for architecture and system definition (the analysis and definition, management, maintenance, and evolution of the GPS Enterprise requirements and interface technical documents) as well as for the planning, execution, and fielding of the GPS Enterprise.

OCX funds support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, modernization initiatives, systems engineering, system development, resolving obsolescence issues, test and evaluation efforts, and mission operations. These activities support upgrades and product improvements for military and civil applications necessary to enable efforts to protect United States (U.S.) Military and Allies' use of GPS. Additionally, funds ensure OCX efforts meet current and future Joint Requirements Oversight Council (JROC) approved required capabilities.

OCX Block 3F will upgrade OCX with new capabilities to synchronize with GPS IIIF Space Segment and Military GPS User Equipment (MGUE) Increment 2 capabilities. OCX Block 3F is required to launch and operationally command and control GPS IIIF space vehicles. This includes advanced concept development such as systems analysis, modernized control segment development, modernization/deployment of 17 monitoring stations, mission planning development, training simulators, integrated logistics support products, test resources, systems engineering required to meet the Government's obligations to the international, military and civil communities, and system requirements verification. OCX Block 3F will maintain backward compatibility to support the legacy constellation develop solutions necessary to command,

control and monitor GPS IIIF, to include advance collection and integration of RMP high power regional M-code signals, rapid warfighter effects and support to GPS auxiliary payloads.

The GPS Enterprise consists of Space, Ground Control, Nuclear Detonation (NUDET) Detection System (NDS) and User Equipment Segments. The Government is responsible for the integration of the GPS Segments such that they provide worldwide PNT capability to support the warfighter and over four billion national security, civil, Allied, and commercial GPS users.

The GPS EI project includes critical efforts associated with the Government's responsibility to accomplish integration of multiple prime contracts across the three GPS enterprise segments along with the transition to sustainment and operational communities. The GPS EI maintains the GPS current architecture and system definition, controls and validates interfaces, ensures compatibility across current Generation II and III systems, and ongoing developments such as GPS IIIF space systems, OCX control systems, and MGUE Inc 1 and MGUE Inc 2 systems. GPS EI also develops/manages plans for execution and fielding of new capability like the new Military Code for use at the earliest opportunity. Further, GPS EI provides modeling, simulation, and technical analyses of impacts for Government directed enterprise level trades among the GPS segments leading to definition, management, maintenance, and evolution of the GPS Enterprise requirements and interface technical documents to build and ensure the integrity of the enterprise technical baseline, and perform system requirements verification.

In addition, the GPS EI project funds the technical evolution, risk reduction, enterprise-level testing and delivery of all PNT Enterprise, capabilities. The GPS EI project also assists in the analysis and assessment of futures technology to continue the advancement of the PNT enterprise ensuring PNT capabilities continue to be at the forefront. Examples for Generation II include electronic protection, for Generation III, additional anti-jamming protection and additional civil signals. To accomplish this, GPS EI delivers Test and Verification capabilities, Requirements and Interface Management, and Systems Integration support across the Space, Control, and User Segments. In this capacity, GPS EI is responsible for managing this cross-program work to provide these and other capabilities.

GPS EI's analyses guides Government decisions to ensure efficient and effective synchronization and execution across all Generation II and III GPS programs. For Enterprise-wide integration to be successful, the GPS EI: works with the GPS and NDS prime contractor teams to develop plans for early risk reduction System Integration Demonstrations to ensure system interfaces and functionality meet user and system requirements; ensures all equipment and documentation is ready when needed; integrates and analyzes enterprise schedules; and conducts formal test and verification, including Requirement Verification Plans and System Test Plans and Procedures. GPS EI performs all these efforts across all PNT programs in all acquisition phases. The Government owns the GPS Enterprise system requirements and integration, and highly leverages the GPS EI team to eliminate the need to fund a development prime contractor to perform these functions. This enhances Government control, oversight and program accountability.

In a future budget cycle, PE 1206423F, Global Positioning System III - Operational Control Segment, Project 67A025, GPS Enterprise Integrator efforts will be transferred to PE 1203269SF, Global Positioning System IIIF, Project 653170, Space Programs, in order to continue enterprise integration activities after OCX activities are completed.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships,

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1206423SF *I Global Positioning System III - Operational Control Segment*

and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This PE may include necessary civilian pay expenses required to manage, execute, and deliver OCX weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in PEs 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	481.999	406.136	0.000	406.136
Current President's Budget	0.000	481.999	413.766	0.000	413.766
Total Adjustments	0.000	0.000	7.630	0.000	7.630
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	7.630	0.000	7.630

Change Summary Explanation

FY 2022: +20.800M; Funding increased to GPS III OCX Non-Advocate Cost Assessment (NACA)
FY 2022: -8.035M; Funding transferred to GPS sustainment support contract
FY 2022: -5.135M; Funding decreased to adjust for inflation

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / *Global Positioning System III - Operational Control Segment*	Project (Number/Name) 67A021 / *OCX*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
67A021: *OCX*	0.000	0.000	421.664	357.577	0.000	357.577	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

GPS is a space based PNT distribution system which operates through all weather. This project funds the research and development for OCX. This includes, but is not limited to, advanced concept development, systems engineering and analysis, modernized control segment and mission planning development, modernization/ deployment of 17 monitoring stations, training simulators, integrated logistics support products, and test resources.

OCX acquisition was established to: 1) provide command and control of legacy and GPS III satellites; 2) incorporate situational awareness to support Navigation Warfare (NAVWAR) and signal monitoring; 3) enable mission capability upgrades to support a warfighter effects-based approach to operations; and 4) integrate DoD information assurance and cybersecurity controls and capabilities. OCX funds will support efforts such as engineering studies and analyses, architectural engineering studies, trade studies, technology needs forecasting, technology development, systems engineering, system development, test and evaluation efforts and mission operations in support of upgrades and product improvements for military and civil applications necessary to support efforts to protect U.S. military and Allies' use of GPS. Additionally, funds will ensure efforts to meet current and future JROC approved required capabilities.

OCX Block 0 (through Iteration 1.5) is the Launch and Control System (LCS) intended to conduct Launch and Early Orbit (LEO) operations and the on-orbit checkout of all GPS III satellites. OCX Block 0 is a subset of OCX Block 1.

OCX Block 1 (adds Iterations 1.6, 1.7 and 2.1 to Block 0) fields the operational capability to control all legacy satellites and civil signals (L1C/A), military signals (L1P(Y), L2P(Y)) as well as the GPS III satellites and the modernized civil signal (L2C) and the aviation safety-of-flight signal (L5). In addition, Block 1 will field the basic operational capability to control the modernized military signals (L1M and L2M M-Code), and the globally compatible signal (L1C). It also fully meets information assurance/cyber defense requirements.

OCX Block 2 fields the advanced operational capability to control the advanced features of the modernized military signals (L1M and L2M M-Code). Blocks 1 & 2 are being delivered concurrently as a result of the Oct 2016 Nunn-McCurdy review.

OCX Block 3F will modify OCX Blocks 1 and 2 to field new capabilities in support of the GPS III Follow-On (GPS IIIF) production program and incorporate Regional Military Protection (RMP) to handle future threats. OCX Block 3F will upgrade OCX with new capabilities to synchronize with GPS IIIF Space Segment and Military GPS User Equipment (MGUE) Increment 2 capabilities. OCX Block 3F will maintain backward compatibility with the existing capabilities to support the legacy GPS constellation and integrate into Block 1 and 2 and future efforts to support GPS IIIF. The OCX Block 3F effort will develop solutions necessary to launch, command, control, and monitor GPS IIIF spacecraft and include advance collection and integration of RMP high-power regional Military Code (M-Code) signals, rapid warfighter effects, and support to GPS IIIF auxiliary payloads (including Search and Rescue (SAR), Nuclear Detonation (NUDET) Detection System (NDS).

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: OCX Development	-	310.108	215.764
Description: Development of GPS OCX system to launch GPS III, operate a mixed GPS II and GPS III constellation, and provide for a robust Information Assurance system. ***FY 2021 Plans:*** Complete Iteration 1.7 and 2.1 integration and test activities, conduct Formal Qualification Testing, and certify the mission software on IBM hardware. Continue contractor support of the Block 0 baseline that is supporting GPS III satellite launch and checkout. Continue deployments of monitoring stations and legacy ground antenna upgrades. Continue software and hardware obsolescence remediation and replacement of obsolete pre-existing servers. Prepare sites to accept updated operational environments and begin system maturity demonstrations, known as TRROs, in support of the transition from the legacy OCS to OCX; begin LiveSky testing and Kalmann filter tuning. Refresh pre-operational contractor support contract line items in preparation for system acceptance and DD250. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Complete software and hardware obsolescence remediation and replacement of obsolete IBM servers. Conduct system level Site Acceptance Testing (SAT) encompassing full system interactions, external connections, performance requirements, and key performance parameters (KPPs) / key system attributes (KSAs) culminating in system acceptance and DD250. Conduct system maturity demonstrations, known as Transition Risk Reduction Opportunities (TRROs), in support of transition from the legacy OCS to OCX. Begin formal Pre-Operational Support activities for Block 0, 1, and 2, and begin government Developmental Testing and Integrated System Testing activities. Perform contract closeout activities past DD250 for applicable contract line items. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY2022 decreased compared to FY 2021. OCX Block 1 & 2 will achieve DD250 in FY 2022. Activities will transition to system maturity demonstrations/TRROs and SATs.			
Title: Technical Support	-	38.956	24.279
Description: Development of the Standardized Space Trainer (SST) to provide GPS III operator training. Development of Enterprise Mission Planning Systems. Facilities upgrades for Control Stations and associated equipment and servers. Systems Engineering (SE) including Technical Mission Analysis (TMA), Modernization SE and Technical Support, and Test and Evaluation (T&E). ***FY 2021 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Complete work on the SST and development demonstration of capabilities. Continue data collection, and tuning of the monitoring stations equipment and OMSRE. Begin technical support of TRROs and Integrated System Test. ***FY 2022 Plans:*** Deliver SST. Demonstrate and test SST capabilities. Continue data collection, and tuning of the monitoring stations equipment and OMSRE. Begin Pre-Operational support and complete technical support of Site Acceptance Testing (SAT), TRROs, and Integrated System Test (government developmental testing). ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021. OCX Block 1 and 2 will achieve DD250 in FY 2022 and will require less Technical Support as the program transitions to sustainment.			
Title: OCX Block 3F ***Description:*** OCX Block 3F will upgrade OCX Block 1 & 2 with new capabilities necessary for the launch and operation of GPS IIIF and incorporate RMP to handle future threats. OCX Block 3F will maintain backward compatibility to support the legacy constellation develop solutions necessary to command, control and monitor GPS IIIF, to include advance collection and integration of RMP high power regional M-code signals, rapid warfighter effects and support to GPS auxiliary payloads. ***FY 2021 Plans:*** Award OCX Block 3F contract. Conduct requirements analysis and decomposition, early system design, systems engineering, and initial development hardware purchase to begin development and test, to include preparations for Milestone B. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2022 Plans:*** Completion of Milestone B in preparation for coding. Continue development and delivery of the unclassified and classified software factory to support software development and testing. Support GPS Enterprise risk reduction efforts including GPS Systems Integration (SI) Demos to mitigate risks for key interfaces and functionality between the enterprise segments, and Tabletops to mitigate cybersecurity threats. Perform initial coding and test launch and checkout capabilities in order to conduct Enterprise Integration Touch Points (EITP) to support Launch Readiness Tests (LRT) for GPS IIIF space vehicles. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:***	-	72.600	117.534

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
FY 2022 increased compared to FY 2021. OCX Block 3F increases development activities in preparation for MS B, which initiates development of software factories and SST efforts. Initial development activities also include Mission Readiness support for GPS IIIF space vehicles.			
Accomplishments/Planned Programs Subtotals	-	421.664	357.577

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• RDTE 07 1203265F: *GPS III Space Segment*	-	10.777	7.207	0.000	7.207	-	-	-	-	-	-
• RDTE 05 1203269SF: *GPS III Follow-on*	-	285.496	264.265	0.000	264.265	-	-	-	-	-	-
• SPSF 01 GPSIII: *GPS III Space Segment*	-	20.122	84.452	0.000	84.452	-	-	-	-	-	-
• SPSF 01 GPS03C: *GPSIII Follow On*	-	597.796	601.418	0.000	601.418	-	-	-	-	-	-

Remarks

D. Acquisition Strategy

The Space Force is pursuing a "Block" approach for OCX in order to respond to warfighter capability requirements. The strategy calls for capability (e.g., better signal maintainability Unified S-Band (USB), Search and Rescue (SAR) GPS, and near-real time Command and Control (C2)), on-ramps for the follow-on contract for GPS III Space Vehicles (SVs) (starting no earlier than SV11) which will require updates to the OCX ground segment. Enterprise studies will ensure GPS Enterprise synchronization across space and ground segments. The OCX Block 3F program is structured as a tailored ACAT II program with an award in 3Q FY2021. OCX Block 3F is utilizing an agile software development approach and updates the Block I & II baseline in order to deliver OCX Block 3F requirements.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS OCX Phase B OCX Block 1 & 2 Development	C/CPAF	Raytheon : Aurora, CO	0.000	-		279.989	Oct 2020	184.437	Oct 2021	-		184.437	-	-	-
GPS OCX Block 3F Development	Various	Various : Various	0.000	-		72.600	Mar 2021	117.534	Nov 2021	-		117.534	-	-	-
GPS OCX Technical Mission Analysis	MIPR	Various : Various	0.000	-		18.786	Dec 2020	15.265	Nov 2021	-		15.265	-	-	-
GPS OCX Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	0.000	-		7.123	Dec 2020	10.408	Nov 2021	-		10.408	-	-	-
GPS OCX Modernization/ SE & Tech Support	Various	Various : Various	0.000	-		6.694	Dec 2020	0.100	Nov 2021	-		0.100	-	-	-
GPS OCX Standardized Space Trainer (SST)	C/CPAF	Sonalyst, Inc. : Waterford, CT	0.000	-		5.000	Dec 2020	1.500	Nov 2021	-		1.500	-	-	-
GPS OCX Enterprise Mission Planning	MIPR	Various : Various	0.000	-		5.800	Jan 2021	5.800	Jan 2022	-		5.800	-	-	-
		Subtotal	0.000	-		395.992		335.044		-		335.044	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS OCX T&E	C/Various	Various : Various	0.000	-		2.677	Mar 2021	1.614	Mar 2022	-		1.614	-	-	-
		Subtotal	0.000	-		2.677		1.614		-		1.614	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS OCX FFRDC	MIPR	Various : Various	0.000	-		2.036	Oct 2020	3.386	Oct 2021	-		3.386	-	-	-
GPS OCX A&AS	Various	Various : Various	0.000	-		20.019	Feb 2021	16.633	Nov 2021	-		16.633	-	-	-
GPS OCX Other Support	Various	Various : Various	0.000	-		0.940	Oct 2020	0.900	Oct 2021	-		0.900	-	-	-

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
		Subtotal	0.000	-		22.995		20.919		-		20.919	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		421.664		357.577		-		357.577	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

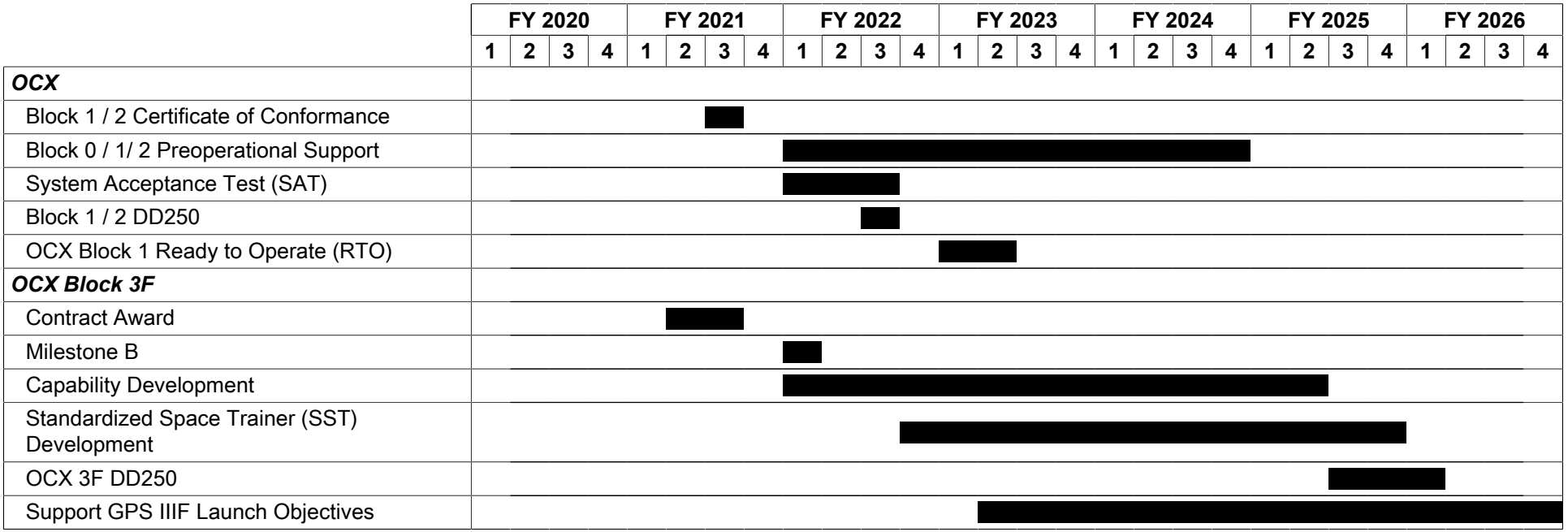

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A021 / *OCX*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
OCX				
Block 1 / 2 Certificate of Conformance	3	2021	3	2021
Block 0 / 1/ 2 Preoperational Support	1	2022	4	2024
System Acceptance Test (SAT)	1	2022	3	2022
Block 1 / 2 DD250	3	2022	3	2022
OCX Block 1 Ready to Operate (RTO)	1	2023	2	2023
OCX Block 3F				
Contract Award	2	2021	3	2021
Milestone B	1	2022	1	2022
Capability Development	1	2022	2	2025
Standardized Space Trainer (SST) Development	4	2022	4	2025
OCX 3F DD250	3	2025	1	2026
Support GPS IIIF Launch Objectives	2	2023	4	2026

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	R-1 Program Element (Number/Name) PE 1206423SF / *Global Positioning System III - Operational Control Segment*	Project (Number/Name) 67A025 / *GPS Enterprise Integrator*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
67A025: *GPS Enterprise Integrator*	0.000	0.000	60.335	56.189	0.000	56.189	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The GPS Program Office established and maintains the technical baseline and is responsible for the successful fielding of all the GPS Segments (space, control, and user). In order to successfully execute these responsibilities, GPS Enterprise Integrator (EI) creates an enterprise architecture, integrates segment products, verifies the enterprise requirements are adequately met, develops and implements various Systems Engineering documents, defines methods of verification, conducts integrated system test and test analysis, develops and manages the Enterprise technical baseline which reflect multiple stakeholder requirements; Stakeholders include the Department of Defense (DoD), foreign governments, industry, and the general public (through four public interface specifications). Furthermore, GPS EI ensures PNT capabilities meet the warfighter's, civil agencies, commercial entities, international treaties, and over four billion global GPS users needs. Moreover, GPS EI is responsible for delivering a reliable PNT signal capability to military operators, the civil user community, and international partners. In addition, GPS EI validates the system performance in various mission threat scenarios during its development as well as provides in-depth technical expertise to enhance government control, oversight and program accountability. GPS EI is also responsible for all aspects of schedule and technical alignment across the GPS segments (space, control, and user).

More specifically, GPS EI is responsible for technical baseline management, integration, synchronizing, testing, and verifying GPS III, GPS IIIF, Operational Control System (OCS), OCX, Military Global Positioning System User Equipment (MGUE) Increment 1 and Increment 2, and other PNT investment projects. Additionally, GPS EI is responsible for creating and managing plans that provide early exercise of the products under development, compatibility analysis, and inter-segment testing. The inter-segment tests are required to prove OCX interoperability with GPS III satellites and Modernized User Equipment. More importantly, it ensures backwards compatibility with legacy systems such as, GPS Block II satellites, OCS and legacy user equipment. The GPS EI also manages the process through which the JROC validated requirements are matured and flowed down to the system segments, while remaining consistent with various interfaces. This enables the GPS system to meet Title 10 of the USC, Sec 2281, mandated PNT capabilities, and various other obligations to the international community that provide inter-operable PNT signals.

GPS EI also supports GPS spectrum protection at international forums such as the International Telecommunications Union. Such support consists of advocating on behalf of the United States (U.S.) Government when negotiating with foreign partners. In addition, GPS EI provides technical expertise to maintain relationships with other U.S. government agencies that include the Federal Aviation Administration (FAA), National Geospatial-Intelligence Agency (NGA), National Aeronautics and Space Administration (NASA) and Departments of State (DOS), Transportation (DoT), Homeland Security (DHS), and Commerce (DOC). GPS EI Spectrum also ensures GPS priority for eight essential spectrum signals, including those required for civil air navigation and safety of life. Spectrum Protection prevents encroachment from commercial or foreign entities, which results in the preservation of warfighter's reliable signal. As a result, military operations and the integrity of the global economic infrastructure are protected.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*

GPS EI also manages GPS and other navigation system performance monitoring and publishes performance specifications and reports to ensure anomalies with GPS can be resolved. In addition GPS EI provides technical expertise for the development for GPS program technical baselines and public specifications to make certain that the Department of Defense (DOD) fulfills its commitment to the world for civilian GPS Service.

GPS EI also provides the PNT enterprise expertise in System Safety, Enterprise level System Security Engineering covering Acquisition Systems Program Security (i.e., personnel, industrial, operations, information, sensitive compartmented information, communication, and physical), Program Protection, Foreign Disclosure, Public Release reviews, Mission System Certification and Accreditation, and Enterprise Cybersecurity. GPS EI is accountable for the development, execution, and analysis of the PNT Enterprise Segments, cybersecurity, and associated test cases necessary to deliver a secure operational system.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: GPS Enterprise Integrator	0.000	60.335	56.189

Description: The integration and technical baseline control of all elements of the GPS system (space/control/user) in support of both military and civil users. Test and verification of integrated system performance in preparation for operational test and evaluation.

FY 2021 Plans:
Conduct government security test of OCX block 1 and test planning using simulators to verify test procedures and determine readiness for testing with live assets of OCX Block 1, and GPS III, (IST 3-1) in preparation for an integrated test for OCX that includes OCX Block 1, the full GPS satellite constellation with GPS III, and MGUE available on all four service lead platforms (IST 3-2). In addition, perform OCX adversarial cyber tests, M-code live sky and support OCX operational test. Support MGUE increment one Operational Testing (IST 3-3) on all four service lead platforms. Support delivery and testing for SMPS 5C update that allows full tasking for M-Code and OCX compatibility. Initiate planning for IST 3-4 to verify functionality of MGUE increment 2 and M-Code handheld receivers. Transition MCEU (IST 2-6) from Operational Test activities into operations. Align enterprise to seamlessly transition control of the GPS constellation from OCS to OCX. Support launch and on- orbit checkout testing of SVs 06-07. Support planning and execution of test events for SVs 08. Conduct modeling and simulation to verify capability of GPS IIIF to operate in a contested environment. Continue cybersecurity tests across all GPS segments (space/control/user). Develop technical specifications for operation of Regional Military Protection (RMP). Continue to conduct tests and analyses to protect GPS users from interference sources that threaten performance of GPS receivers. Participate in international GNSS forums to advocate for GPS regulatory and technical interests. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Continue program office and other related support activities that
may include, but are not limited to studies, technical analysis, prototyping, etc.

FY 2022 Plans:
Continue SMC-led integrated test, operational evaluation, and transition to operations of the Next Generation Operational Control Segment (OCX) and MGUE Increment 1 receivers. Shift responsibility for integrated test and evaluation planning from Prime contractors to Government responsibility. Shift scope of test activities from limited, internal, contractor-led development

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
tests to expansive, integrated, multi-stakeholder, Government-led development and operational test using operational assets, facilities and resources (OCX Site Acceptance Testing, OCX Transition Risk Reduction to Operations, IST 3-1 for OCX, MOT&E for OCX-dependent capabilities, IST 3-3 Phase 4, OT&E for Stryker). Increase support to Government-led cybersecurity and cyber survivability test and evaluation planning and analysis. Evaluate systems for effectiveness in delivering capabilities of GPS Constellation Management, GPS Enterprise M-Code PNT Determination, GPS L2C PNT Determination, and GPS L5 PNT Determination. Support integration planning for OCX Block 3F and GPS III Follow-On SVs. Support operational demonstration of Vanguard NTS-3 program and acquisition planning for transition to operations. Participate in international Global Navigation Satellite System (GNSS) forums to advocate for GPS regulatory and technical interests. Support GPS III SV09 delivery, launch planning and integration. Support miniature serial interface with next generation application specific integrated circuit prototyping. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, experimentation, prototyping, etc. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 due to transition of operational systems to Operations and Maintenance funding.			
Accomplishments/Planned Programs Subtotals	0.000	60.335	56.189

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
• RDTE 04 1203164F: *NAVSTAR Global Positioning System (User Equipment) (SPACE)*	-	380.704	434.194	0.000	434.194	-	-	-	-	-	-
• RDTE 07 01203265SF: *GPS III Space Segment*	-	10.777	7.207	0.000	7.207	-	-	-	-	-	-
• RDTE 05 1203269SF: *GPS III Follow-On (GPS IIIF)*	-	285.496	264.265	0.000	264.265	-	-	-	-	-	-
• RDTE 07 1203913F: *NUDET Detection System (SPACE)*	-	29.157	46.887	0.000	46.887	-	-	-	-	-	-
• SPSF 01 GPSIII: *GPS III Space Segment*	-	20.122	84.452	0.000	84.452	-	-	-	-	-	-
• SPSF 01 BA01 GPSIIIF: *GPSIII Follow On*	-	597.796	601.418	0.000	601.418	-	-	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost

Remarks

D. Acquisition Strategy

In accordance with a "back to basics" acquisition approach the Space Force is required to exercise complete ownership of the architecture, system definition, technical baseline, and integration of the GPS space, ground, and user segments. This complex inter-segment integration requires the government to be the integrator. To execute this responsibility, the government leverages systems engineering and integration expertise from both Federally Funded Research and Development Center (FFRDC) contractors and a Systems Engineering & Integration (SE&I) contractor. The GPS EI function of the SE&I contractor is currently funded within this PE. The SE&I effort was awarded in 2015 through a full and open competition with strategy built in year over year cost reductions as requirements stabilize. A SE&I follow-on is planned for award in the 4th Quarter of FY 2021. The GPS EI effort will transition from PE 1206423SF to PE 1203269SF, Appn 3620 in a future budget cycle.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS EI Enterprise SE&I	C/CPAF	TASC : El Segundo, CA	0.000	-		34.518	Nov 2020	31.837	Nov 2021	-		31.837	-	-	-
GPS EI Technical Mission Analysis 1	MIPR	Aerospace : El Segundo, CA	0.000	-		9.074	Oct 2020	9.346	Oct 2021	-		9.346	-	-	-
GPS EI Technical Mission Analysis 2	Various	MITRE : Various	0.000	-		10.050	Oct 2020	10.042	Oct 2021	-		10.042	-	-	-
GPS EI MRTA/MSTA	C/CPAF	Draper Labs : Cambridge, MA	0.000	-		1.544	Dec 2020	0.517	Dec 2021	-		0.517	-	-	-
GPS EI Cybersecurity	Various	Various : El Segundo, CA	0.000	-		1.208	Dec 2020	1.379	Dec 2021	-		1.379	-	-	-
GPS EI Additional Product Development	Various	Various : Various	0.000	-		1.466	Oct 2020	0.800	Oct 2021	-		0.800	-	-	-
		Subtotal	0.000	-		57.860		53.921		-		53.921	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
GPS EI FFRDC	Various	Various : El Segundo, CA	0.000	-		0.800	Oct 2020	0.165	Oct 2021	-		0.165	-	-	-
GPS EI A&AS	Various	Various : El Segundo, CA	0.000	-		1.445	Oct 2020	1.903	Oct 2021	-		1.903	-	-	-
GPS EI Other Support	Various	Various : Various	0.000	-		0.230	Oct 2020	0.200	Oct 2021	-		0.200	-	-	-
		Subtotal	0.000	-		2.475		2.268		-		2.268	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		60.335		56.189		-		56.189	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*

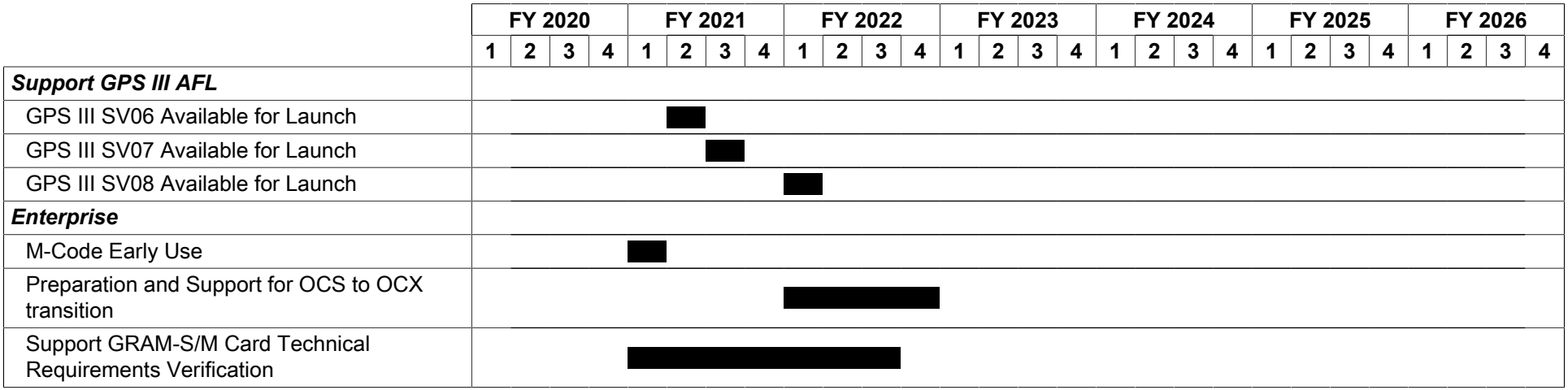

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206423SF / *Global Positioning System III - Operational Control Segment*	**Project (Number/Name)** 67A025 / *GPS Enterprise Integrator*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Support GPS III AFL				
GPS III SV06 Available for Launch	2	2021	2	2021
GPS III SV07 Available for Launch	3	2021	3	2021
GPS III SV08 Available for Launch	1	2022	1	2022
Enterprise				
M-Code Early Use	1	2021	1	2021
Preparation and Support for OCS to OCX transition	1	2022	4	2022
Support GRAM-S/M Card Technical Requirements Verification	1	2021	3	2022

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force											Date: May 2021	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1206770SF / *Enterprise Ground Services*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	0.000	116.791	191.713	0.000	191.713	-	-	-	-	-	-
673140: *Enterprise Ground Services EGS*	-	0.000	116.791	191.713	0.000	191.713	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Today's rapidly changing threat environment requires the Department of Defense to deliver agile, integrated, and resilient effects in, from, and through space to meet the nation's warfighting needs. The Enterprise Ground Services (EGS) program will provide a robust enterprise ground architecture for United States Space Force (USSF) satellite systems. EGS capability will become the primary ground command and control (C2) suite of services for the Space Force enterprise to meet evolving current and future space domain demands that will fully enable warfighting effects to maintain United States space dominance. EGS is based on Multi-Mission Satellite Operations Center (MMSOC) C2 capabilities developed under the Research and Development Space and Missile Operations (RDSMO) program.

The EGS program will perform technology maturation, development, prototyping and operational mission transition for increased commonality and resiliency in space program systems. EGS will focus efforts on the rapid development and deployment of tactical C2 services, developing and integrating on-premise and cloud infrastructure to laboratories and multiple sites, exploring advanced concepts, developing prototypes and demonstrations, maturing user experience, refining Concept of Operations (CONOPs), and supporting cybersecurity operations and operational mission training. These efforts will require support such as systems engineering, integration and test, standards and interface development, architecture development, enhanced cybersecurity development and implementation. Programs and projects in the space warfighting enterprise are evaluating ways to maximize innovation, resiliency, and the ability to respond to known and emerging threats. Space enterprise efforts aim to execute technology risk-reduction efforts and integrate new or re-purposed capabilities, enterprise decision-making tools, experimentation, and rapid prototyping and fielding via all appropriate acquisition authorities and contract mechanisms.

Over the Future Years Defense Program (FYDP), EGS will be developing and deploying C2 services and software applications that support integrating legacy and new missions such as Missile Warning; Missile Defense; MILSATCOM; Positioning, Navigation, and Timing; Environmental Monitoring; Space Domain Awareness; and various classified and experimental satellites and missions to the EGS open architecture. The modifications to catalog software applications provided by EGS are being made in an agile development, security, and operations (DevSecOps) environment.

Space acquisition must respond with speed and agility to emerging adversary threats. The Space and Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1206770SF / *Enterprise Ground Services*

The program element may include necessary civilian pay expenses required to manage, execute, and deliver EGS capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	116.791	194.090	0.000	194.090
Current President's Budget	0.000	116.791	191.713	0.000	191.713
Total Adjustments	0.000	0.000	-2.377	0.000	-2.377
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-2.377	0.000	-2.377

Change Summary Explanation

FY 2022: -2.377M; funding decreased to adjust for inflation

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Enterprise Ground Services (EGS) Development	-	71.291	105.313
Description: Integrate common applications and services, refine standards and interfaces, develop and implement cybersecurity and cryptography requirements, refine training and CONOPs, and mature advanced concepts. Support prototype mission partner demonstrations and integration and test of mission-unique software. Expand the development environment in order to develop software applications and services in support of integrating additional satellite missions. ***FY 2021 Plans:*** Continue maturation of EGS laboratories including providing an on-premises and cloud based DevSecOps capability at the Space Management Battle Lab at the Catalyst Campus in Colorado. Continue the development and deployment of C2 services, prototype mission partner demonstrations, crypto development and implementation, platform development and interface refining, training and CONOPs refinement, advance concept maturation, support integration and test of mission unique software, and			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1206770SF *I Enterprise Ground Services*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
integration of common applications and services at the distributed System Integration Lab, and cybersecurity for EGS related systems only. EGS developed cyber services to date have utility outside of EGS and this position only supports cyber services for EGS. EGS plans to leverage USSF HQ enterprise cyber services to support mission needs and has removed those efforts from its request. Expand User Experience guidelines and user interface specifications to include multiple services beyond Telemetry, Tracking and Commanding (TT&C); Ground Resource Manager; and Mission Management. Expand EGS core services based on mission needs. Mature EGS deployment automation and testing. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to program office support, studies, technical analysis, demonstrations, prototyping, etc. ***FY 2022 Plans:*** Complete maturation of EGS laboratories, including providing an on-premise and cloud-based DevSecOps capability, at the Catalyst Campus in Colorado Springs, Colorado. Continue the development and deployment of C2 services, prototype mission partner demonstrations, implement cybersecurity and cryptography development, update platform development and interfaces, refine training and CONOPs, mature advanced concepts, support integration and test of mission-unique software, and integrate common applications and services at the distributed System Integration Lab (SIL). Continue expanding User Experience guidelines and user interface specifications to complete delivery of seven Enterprise services for mission partner integration and Initial Enterprise Capability Minimum Viable Product (MVP): TT&C; Ground Resource Manager; Ground Resource Scheduler; Transmit/Receive; Archiving; Platform; and Infrastructure. Expand EGS catalog services based on mission needs, including Mission Planning, Data Analytics, and Flight Dynamics. Mature EGS deployment automation and testing. Implement system resiliency and situational awareness necessary to operate in the contested space domain. Procure infrastructure for scaling to support mission partner integration onto EGS. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, and prototyping. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 to deliver Initial Enterprise Capability MVP and procure infrastructure in order to double the number of EGS services and increase support for services to eight mission partners with a multi-node, resilient architecture.			
Title: EGS Pre-Operations (Pre-Ops) Support ***Description:*** Maintain EGS hardware and software baselines, update software licenses, cybersecurity, help-desk operations, and associated training. ***FY 2021 Plans:*** Conduct pre-ops support activities for satellites using enterprise services to include maintaining EGS hardware and software baselines, updating software licenses, prototyping and extending help desk operations at multiple locations, as well as associated	-	19.600	40.100

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1206770SF *I Enterprise Ground Services*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
training and cyber security support for EGS only. Implement state of the art hardware components at key EGS operational locations as needed. ***FY 2022 Plans:*** Continue conducting pre-ops support activities for satellites using enterprise services to include maintaining EGS hardware and software baselines for 14 services, updating software licenses, prototyping, furthering continuous integration/continuous delivery (CI/CD) efforts, facilitating user engagement, and extending helpdesk operations at multiple locations, and associated training and cybersecurity support for EGS. Implement state-of-the-art hardware components at key EGS operational locations. Complete GEO Non-Integrated Tactical Warning/Attack Assessment (ITW/AA) Operations Migration to EGS (GNOME) effort. Scale service center capabilities to support growth of mission partners from two to eight using EGS, accomplish infrastructure technical refresh, patching, and cyber updates. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 in order to double the number of EGS services and increase support for services to eight mission partners and infrastructure technical refresh.			
Title: EGS Deployment	-	25.900	46.300
Description: Rapidly deploy tactical C2 services and space domain capabilities to support customer-funded mission integration with EGS activities including future mission acquisition planning and risk-reduction efforts. ***FY 2021 Plans:*** Continue the operational deployment of C2 services and maturation of networks and links across the EGS enterprise. Continue integration efforts with current and future space domain capabilities. Expand service offerings and functionality for both existing and new satellites that will use EGS. Continue developing the programmatic, technical and architectural roadmap to enable the phased transition of mission partners to EGS. Support customer-funded mission transition plans including future mission acquisition planning and risk reduction efforts. ***FY 2022 Plans:*** Continue the operational deployment of C2 services and maturation of networks and links across the EGS enterprise to support growth from two to eight mission partners. Continue integration efforts with current and future space domain capabilities. Expand service offerings and functionality for both existing and new satellites that will use EGS. Continue developing the programmatic, technical and architectural roadmaps to enable the phased integration of mission partners to EGS. Provide technical information and guidance to programs which are developing EGS interfaces, mission applications, factory connectivity, and integration and test plans and procedures. Support customer-funded mission integration plans including future mission acquisition planning and risk-reduction efforts. Support deployment of enterprise ground services to different infrastructures, to scale capabilities for			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1206770SF *I Enterprise Ground Services*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
additional missions to use EGS, and to support services integration. Establish initial capability at Schriever Air Force Base and prepare for initial capability at Kirtland Air Force Base. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 for mission partner integration at multiple EGS locations.			
Accomplishments/Planned Programs Subtotals	-	116.791	191.713

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

E. Acquisition Strategy

The EGS acquisition strategy focuses on rapidly delivering C2 prototypes and operational capabilities to warfighters, while leveraging industry best practices for agile development and continuous integration/delivery (CI/CD). One of the key tenets of the EGS acquisition strategy is to maintain government ownership of the technical baseline. As a result, EGS uses a combination of existing and new contracts and agreements with industry and academia to procure prototypes, platform services, system engineering services, and pre-ops support for mission users. EGS will leverage the two Small Business Innovation Research (SBIR) Phase III contracts that were awarded sole source in late FY 2019 to scale EGS capabilities and enable more rapid development and deployment of tactical C2 services to operational users. Additionally, EGS provides development, integration, and pre-ops support for mission users through a contract competitively awarded in FY 2020.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206770SF / *Enterprise Ground Servic es*	**Project (Number/Name)** 673140 / *Enterprise Ground Services EGS*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
EGS Development	Various	Various : Various	-	-		46.569	Nov 2020	89.361	Nov 2021	-		89.361	-	-	-
EGS Pre-Ops Support	Various	Various : Various	-	-		7.184	Dec 2020	33.910	Dec 2021	-		33.910	-	-	-
EGS Deployment	Various	Various : Various	-	-		32.158	Nov 2020	34.100	Nov 2021	-		34.100	-	-	-
EGS Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	-		4.595	Oct 2020	5.447	Oct 2021	-		5.447	-	-	-
Enterprise Systems Engineering and Integration (SE&I)	Various	MITRE : Bedford, MA	-	-		13.713	Oct 2020	11.700	Oct 2021	-		11.700	-	-	-
		Subtotal	-	-		104.219		174.518		-		174.518	-	-	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC	RO	Aerospace Corp : El Segundo, CA	-	-		4.474	Oct 2020	2.840	Oct 2021	-		2.840	-	-	-
A&AS Support	Various	Various : Various	-	-		8.048	Dec 2020	13.255	Dec 2021	-		13.255	-	-	-
Other Support	Various	Various : Various	-	-		0.050	Dec 2020	1.100	Dec 2021	-		1.100	-	-	-
		Subtotal	-	-		12.572		17.195		-		17.195	-	-	N/A

	Prior Years	FY 2020		FY 2021		FY 2022 Base		FY 2022 OCO		FY 2022 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	-		116.791		191.713		-		191.713	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206770SF / *Enterprise Ground Services*	**Project (Number/Name)** 673140 / *Enterprise Ground Services EGS*

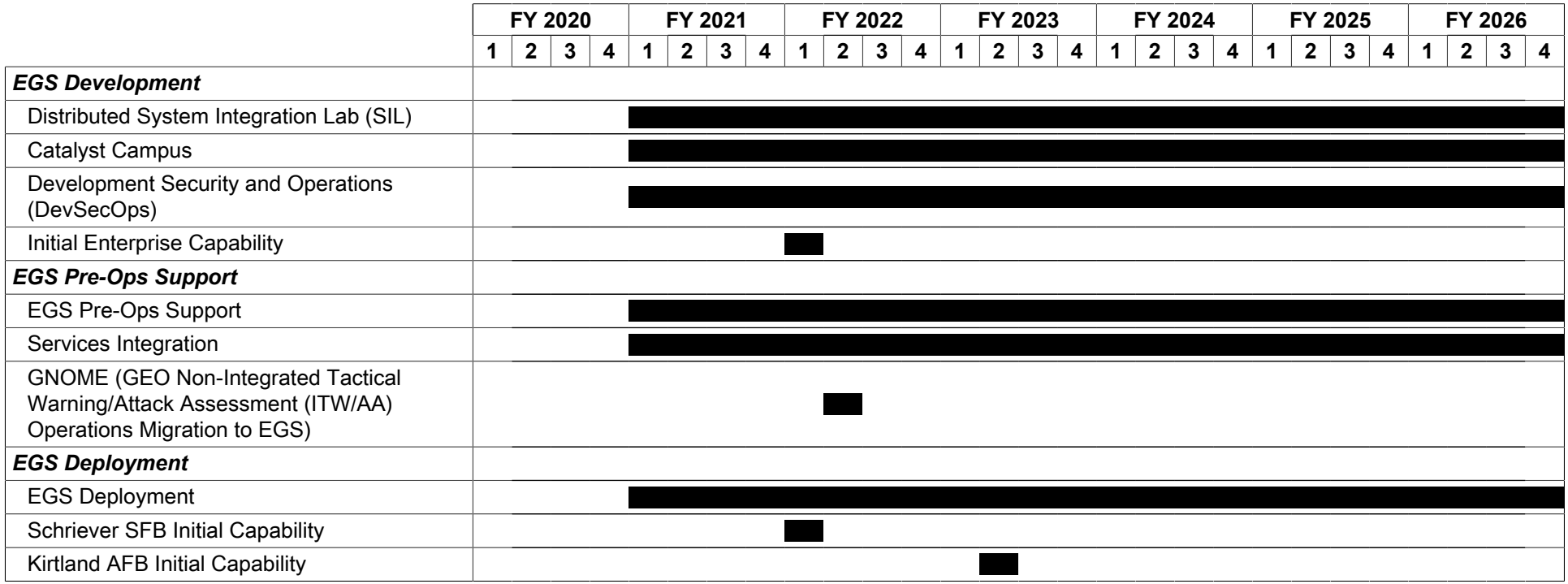

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 7	**R-1 Program Element (Number/Name)** PE 1206770SF / *Enterprise Ground Services*	**Project (Number/Name)** 673140 / *Enterprise Ground Services EGS*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
EGS Development				
Distributed System Integration Lab (SIL)	1	2021	4	2026
Catalyst Campus	1	2021	4	2026
Development Security and Operations (DevSecOps)	1	2021	4	2026
Initial Enterprise Capability	1	2022	1	2022
EGS Pre-Ops Support				
EGS Pre-Ops Support	1	2021	4	2026
Services Integration	1	2021	4	2026
GNOME (GEO Non-Integrated Tactical Warning/Attack Assessment (ITW/AA) Operations Migration to EGS)	2	2022	2	2022
EGS Deployment				
EGS Deployment	1	2021	4	2026
Schriever SFB Initial Capability	1	2022	1	2022
Kirtland AFB Initial Capability	2	2023	2	2023

Note

Singular events depicted above represent milestones. All milestones include effort prior-to and after the event. EGS Initial Enterprise Capability milestone includes initial delivery and maturation of tactical C2 enterprise services and space domain capabilities. EGS Deployment milestones include initial build-outs of EGS enclaves at operational sites. Continuous Integration/Continuous Deployment is on-going. EGS Pre-Ops support milestones include phased initial integration of mission partners and EGS. Pre-ops support is on-going.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 8: *Software and Digital Technology Pilot Programs*					R-1 Program Element (Number/Name) PE 1203614SF / *JSpOC Mission System*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	149.742	154.529	0.000	154.529	-	-	-	-	-	-
68A035: *SSA/BMC2*	0.000	0.000	149.742	154.529	0.000	154.529	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		
Program MDAP/MAIS Code: N82												

A. Mission Description and Budget Item Justification

The FY 2018 National Defense Authorization Act (Sections 873/874) directed the Office of the Secretary of Defense (OSD) to streamline software development. The Space Command and Control (C2) program is an OSD pilot initiative in which all lifecycle funding is tracked under Budget Activity 08 (BA08), Software and Digital Technology Pilot Programs, beginning in FY 2021. Pilot programs enable the execution of modern software development practices encompassing development, procurement, modification and maintenance activities. This program includes RDT&E, space procurement, and Operations and Maintenance funds transferred from PE 1203614F, JSpOC Mission Systems.

The Space Force is developing a Space C2 and Space Domain Awareness (SDA) capability for the Combined Force Space Component Commander (CFSCC) and the Joint Task Force - Space Defense (JTF-SD). The Space C2 program provides a collaborative environment that will enhance and modernize SDA and Battle Management C2 (BMC2) capabilities; create decision-relevant views of the space and multi-domain environment; rapidly detect, track and characterize objects of interest; identify / exploit traditional and non-traditional sources; perform space threat analysis; and enable efficient distribution of data across the Space Surveillance Network (SSN). The program maintains enterprise infrastructure, platform and data services, and develops mission applications to enable responsive, resilient operational-level Space C2 capabilities for the National Space Defense Center (NSDC), Combined Space Operations Center (CSpOC), 18th Space Control Squadron (SPCS) and other C2 centers. Employing an agile-based Rapid Delivery Framework with a 90-day Program Increment (PI) construct fosters a collaborative and integrated environment for the community to effectively plan and deliver C2 capabilities. The enterprise-wide system will provide a common government infrastructure and standards for rapid prototyping of dynamic SDA and BMC2 applications to address the evolving and dynamic threat. The system will provide a collaborative environment that will enhance and modernize SDA and BMC2 capabilities. Funding includes technical studies, development, experimentation, integration and related support costs.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

This Program Element may include necessary civilian pay expenses required to manage, execute, and deliver Space C2 weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in Program Elements 1206392SF and 1206398SF.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 8: *Software and Digital Technology Pilot Programs*	**R-1 Program Element (Number/Name)** PE 1203614SF *I JSpOC Mission System*

This program is in Budget Activity 8, Software and Digital Technology Pilot Program because this budget activity includes funding provided for expenses necessary for agile development, test and evaluation, procurement, production and modification, and the operation and maintenance of these programs.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	0.000	149.742	156.446	0.000	156.446
Current President's Budget	0.000	149.742	154.529	0.000	154.529
Total Adjustments	0.000	0.000	-1.917	0.000	-1.917
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	0.000	-1.917	0.000	-1.917

Change Summary Explanation

FY 2022: -1.917M; funding decreased to adjust for inflation

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Enterprise Space BMC2	-	118.654	123.040

Description: This program delivers a robust and responsive Space Domain Awareness (SDA) and Battle Management Command and Control (BMC2) capability to meet emerging threats. The program will deliver capability for decision makers trying to prevent a conflict from extending to space, or winning it if it does. Capabilities and associated infrastructure include, but are not limited to, the following: SDA, Indications & Warning (I&W), Transmit/Receive, Space Control, Tactical Operations and Common Data Management Layer, Platforms and Infrastructure; and Cyber and Threat Warning. The program maintains foundational DevSecOps enablers such as, but not limited to, Data as a Service, Platform Support, Continuous Improvement/Continuous Deployment (CI/CD) toolchain, and infrastructure and inherent sustainment efforts that are an integral part of the agile software development process. Other activities include dedicated Systems Engineering & Integration (SE&I), Test & Evaluation (T&E), Model Based Systems Engineering (MBSE) and prototype Validation & Verification to support these efforts.

FY 2021 Plans:

Plan and develop a message standard compliant open architecture to support both the SDA and Battle Management Command and Control (BMC2) missions to meet dynamic emerging threats. The architecture and platform/infrastructure will modernize and

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 8: *Software and Digital Technology Pilot Programs*	**R-1 Program Element (Number/Name)** PE 1203614SF *I JSpOC Mission System*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
deliver new capabilities in the National Space Defense Center, Combined Space Operations Center and other operations centers supporting SDA and BMC2. In addition to the architectural efforts, SMC will continue developmental, system engineering and contracting efforts to integrate best in breed commercial, contractor, and government applications through the release of multiple incremental software capability drops throughout FY 2021. Space C2 transitions legacy capabilities to an open architecture ecosystem employing agile software practices. Continue program office and other related support activities that may include but are not limited to studies, technical analysis, and prototyping. ***FY 2022 Plans:*** Plan and develop a message standard compliant open architecture to support both the SDA and BMC2 missions to meet dynamic emerging threats. The enterprise architecture and platform/infrastructure will modernize and deliver new capabilities in the NSDC, CSPOC, and other operations centers supporting SDA, BMC2, Theater Support, Data Analytics & Visualization, and Modeling & Simulation tools. Continue developmental, system engineering and contracting efforts to integrate best in breed commercial, contractor, and government applications through the release of multiple incremental software capability drops throughout FY 2022. Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities include, but are not limited to, program office support, studies, technical analysis, experimentation, and prototyping. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 to account for increased user demand to more rapidly develop and test Space C2 products and services needed to analyze and use SDA data, manage space asset control, and counter escalating space threats.			
Title: Space C2 Sustainment	-	31.088	31.489
Description: The program maintains existing capability for the CSPOC, NSDC and other C2 centers. These tasks include maintaining the Commercial Off The Shelf (COTS) software database, removing and canceling decommissioned systems and unused tools, adding new tools required for ongoing support of the system, maintaining data support systems, and maintaining day to day software operations which continuously ensures and optimizes reliability, security, resiliency, availability, flexibility and scalability of the warfighter tools. ***FY 2021 Plans:*** SMC will fund government software centers, laboratories, and contractors for supporting the update, maintenance and modification, integration, configuration management and cybersecurity requirements of legacy software and associated hardware. Activities may include, but are not limited to, software license acquisition, program office support, studies, and technical analysis. ***FY 2022 Plans:***			

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 8: *Software and Digital Technology Pilot Programs*	**R-1 Program Element (Number/Name)** PE 1203614SF *I JSpOC Mission System*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
SMC will continue to fund government software centers, laboratories, and contractors for supporting the update, maintenance and modification, integration, configuration management and cybersecurity requirements of legacy software and associated hardware. Activities may include, but are not limited to, software license acquisition, program office support, studies, and technical analysis. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 due to inflation.			
Accomplishments/Planned Programs Subtotals	-	149.742	154.529

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

The Space Force is employing agile software development practices such as flexible requirements, frequent user interaction, and rapid delivery and deficiency retirement. The program acquires tools and capabilities through an agile-based Rapid Delivery Framework that delivers and sustains new features and capabilities through a CI/CD pipeline with 90-day Program Increments. This strategy focuses on rapidly delivering capability to warfighters and leveraging commercial, industry and government partners. Currently there are multiple contractors performing on competitively-awarded contracts with no single prime contractor responsible for the entire ecosystem.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 8	R-1 Program Element (Number/Name) PE 1203614SF / *JSpOC Mission System*	Project (Number/Name) 68A035 / *SSA/BMC2*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Space C2 Technical Mission Analysis (WS)	RO	Aerospace : El Segundo, CA	0.000	-		1.000	Dec 2020	1.030	Dec 2021	-		1.030	-	-	-
Space C2 Enterprise Systems Engineering & Integration	Various	Various : Various	0.000	-		5.500	Nov 2020	3.708	Nov 2021	-		3.708	-	-	-
Space C2 Applications	Various	Various : Various	0.000	-		83.780	Nov 2020	85.072	Nov 2021	-		85.072	-	-	-
Space C2 Platform	Various	Various : Various	0.000	-		23.502	Dec 2020	17.409	Dec 2021	-		17.409	-	-	-
Space C2 Infrastructure	Various	Various : Various	0.000	-		14.482	Dec 2020	14.505	Dec 2021	-		14.505	-	-	-
Space C2 Data Management	TBD	TBD : TBD	0.000	-		-		7.500	Nov 2021	-		7.500	-	-	-
		Subtotal	0.000	-		128.264		129.224		-		129.224	-	-	N/A

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Civilian Reimbursable Budget Authority	RO	SMC : El Segundo, CA	0.000	-		0.186	Jan 2021	0.192	Jan 2022	-		0.192	-	-	-
		Subtotal	0.000	-		0.186		0.192		-		0.192	-	-	N/A

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Test	Various	Various : Various	0.000	-		3.000	Dec 2020	4.000	Dec 2021	-		4.000	-	-	-
		Subtotal	0.000	-		3.000		4.000		-		4.000	-	-	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3620F / 8	R-1 Program Element (Number/Name) PE 1203614SF / *JSpOC Mission System*	Project (Number/Name) 68A035 / *SSA/BMC2*	

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
A&AS	C/CPFF	Various : Various	0.000	-		12.837	Nov 2020	15.219	Nov 2021	-		15.219	-	-	-
FFRDC	RO	Various : Various	0.000	-		4.751	Dec 2020	4.894	Dec 2021	-		4.894	-	-	-
Other	Various	Various : Various	0.000	-		0.704	Oct 2020	1.000	Oct 2021	-		1.000	-	-	-
		Subtotal	0.000	-		18.292		21.113		-		21.113	-	-	N/A

	Prior Years	FY 2020 Cost	FY 2020 Award Date	FY 2021 Cost	FY 2021 Award Date	FY 2022 Base Cost	FY 2022 Base Award Date	FY 2022 OCO Cost	FY 2022 OCO Award Date	FY 2022 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	-		149.742		154.529		-		154.529	-	-	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 8	**R-1 Program Element (Number/Name)** PE 1203614SF / *JSpOC Mission System*	**Project (Number/Name)** 68A035 / *SSA/BMC2*

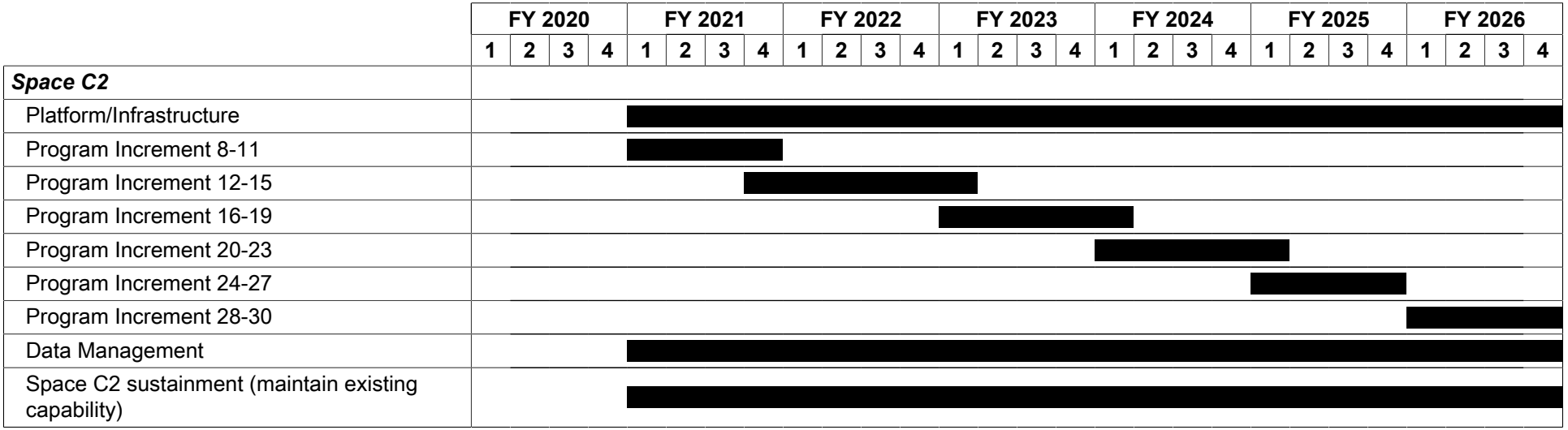

Exhibit R-4A, RDT&E Schedule Details: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3620F / 8	**R-1 Program Element (Number/Name)** PE 1203614SF / *JSpOC Mission System*	**Project (Number/Name)** 68A035 / *SSA/BMC2*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Space C2				
Platform/Infrastructure	1	2021	4	2026
Program Increment 8-11	1	2021	4	2021
Program Increment 12-15	4	2021	1	2023
Program Increment 16-19	1	2023	1	2024
Program Increment 20-23	1	2024	1	2025
Program Increment 24-27	1	2025	4	2025
Program Increment 28-30	1	2026	4	2026
Data Management	1	2021	4	2026
Space C2 sustainment (maintain existing capability)	1	2021	4	2026