

UNCLASSIFIED

**Department of Defense  
Fiscal Year (FY) 2025 Budget Estimates**

March 2024



**Air Force**

*Justification Book Volume 1 of 4*

***Research, Development, Test & Evaluation, Air Force***

UNCLASSIFIED

**UNCLASSIFIED**

**THIS PAGE INTENTIONALLY LEFT BLANK**

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

**Volume 1 Table of Contents**

**Introduction and Explanation of Contents.....Volume 1 - iii**  
**Comptroller Exhibit R-1..... Volume 1 - v**  
**Master Program Element Table of Contents (by Budget Activity then Line Item Number)..... Volume 1 - xxi**  
**Master Program Element Table of Contents (Alphabetically by Program Element Title)..... Volume 1 - xxxix**  
**Summary 3600..... Volume 1 - lv**  
**2025PB OP8 Exhibit 3600..... Volume 1 - lvii**  
**Acronyms..... Volume 1 - lxi**  
**Exhibit R-2s..... Volume 1 - 1**

**UNCLASSIFIED**

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

# UNCLASSIFIED

## Fiscal Year (FY) 2025 President's Budget RDT&E Descriptive Summaries Budget Activities March 2024

### INTRODUCTION AND EXPLANATION OF CONTENTS

#### GENERAL

- This document has been prepared to provide information on the United States Air Force (USAF) Research, Development, Test and Evaluation (RDT&E) program elements and projects in the FY25 Budget Estimate Submission (BES).
  - 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 2025 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 RDT&E funds, Procurement funds and quantities, Military Construction appropriation funds on specific development programs, Operations and Maintenance appropriation funds where they are essential to the development effort described, and where appropriate, Department of Energy (DOE) costs.

UNCLASSIFIED

# UNCLASSIFIED

## 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.

UNCLASSIFIED

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
1	0601102F	Defense Research Sciences	01	U	377,616	401,486	361,930
2	0601103F	University Research Initiatives	01	U	191,797	182,372	143,372
	<b>Basic Research</b>				<b>569,413</b>	<b>583,858</b>	<b>505,302</b>
3	0602020F	Future AF Capabilities Applied Research University Affiliated Research Center (UARC) - Tactical	02	U	93,684	90,713	85,477
4	0602022F	Autonomy	02	U		8,018	8,225
5	0602102F	Materials	02	U	266,944	142,325	142,336
6	0602201F	Aerospace Vehicle Technologies	02	U	188,407	161,268	5,235
7	0602202F	Human Effectiveness Applied Research	02	U	133,233	146,921	138,204
8	0602203F	Aerospace Propulsion	02	U	201,798	184,867	339,477
9	0602204F	Aerospace Sensors	02	U	249,300	216,269	193,029
10	0602212F	Defense Laboratories R&D Projects (10 U.S.C, Sec 2358) Science and Technology Management - Major Headquarters	02	U	107,281		
11	0602298F	Activities	02	U	8,856	10,303	9,662
12	0602602F	Conventional Munitions	02	U	136,169	160,599	138,497
13	0602605F	Directed Energy Technology	02	U	104,085	129,961	114,962
14	0602788F	Dominant Information Sciences and Methods	02	U	258,606	182,076	176,333
	<b>Applied Research</b>				<b>1,748,363</b>	<b>1,433,320</b>	<b>1,351,437</b>
15	0603032F	Future AF Integrated Technology Demos	03	U	144,712	255,855	248,506
16	0603112F	Advanced Materials for Weapon Systems	03	U	53,164	30,372	29,661

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
FY 2025 President's Budget  
Exhibit R-1 FY 2025 President's Budget  
Total Obligational Authority  
(Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
17	0603199F	Sustainment Science and Technology (S&T)	03	U	17,907	10,478	12,558
18	0603203F	Advanced Aerospace Sensors	03	U	35,354	48,046	37,935
19	0603211F	Aerospace Technology Dev/Demo	03	U	95,428	51,896	102,529
20	0603216F	Aerospace Propulsion and Power Technology	03	U	91,041	56,789	
21	0603270F	Electronic Combat Technology	03	U	32,338	32,510	36,445
22	0603273F	Science & Technology for Nuclear Re-entry Systems	03	U	22,893	70,321	91,885
23	0603444F	Maui Space Surveillance System (MSSS)	03	U		2	
24	0603456F	Human Effectiveness Advanced Technology Development	03	U	29,250	15,593	19,568
25	0603601F	Conventional Weapons Technology	03	U	144,026	132,311	125,460
26	0603605F	Advanced Weapons Technology	03	U	81,040	102,997	25,050
27	0603680F	Manufacturing Technology Program	03	U	261,998	44,422	34,730
28	0603788F	Battlespace Knowledge Development and Demonstration	03	U	50,138	37,779	26,172
29	0604776F	Deployment & Distribution Enterprise R&D	03	U			27,762
30	0207412F	Control and Reporting Center (CRC)	03	U		2,005	2,012
<b>Advanced Technology Development</b>					<b>1,059,289</b>	<b>891,376</b>	<b>820,273</b>
31	0603036F	Modular Advanced Missile	04	U	73,250	105,238	
32	0603260F	Intelligence Advanced Development	04	U	7,401	6,237	3,820
33	0603742F	Combat Identification Technology	04	U	13,718	21,298	24,799
34	0603790F	NATO Research and Development	04	U	4,295	2,208	4,498
35	0603851F	Intercontinental Ballistic Missile - Dem/Val	04	U	44,751	45,319	119,197

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.



Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
36	0604001F	NC3 Advanced Concepts	04	U	5,098	10,011	10,148
37	0604003F	Advanced Battle Management System (ABMS)	04	U	229,842	500,575	743,842
38	0604004F	Advanced Engine Development	04	U	212,586	595,352	562,337
39	0604005F	NC3 Commercial Development & Prototyping	04	U	93,485	78,799	68,124
40	0604006F	Dept of the Air Force Tech Architecture	04	U	48,808	2,620	
41	0604007F	E-7	04	U	411,704	681,039	418,513
42	0604009F	AFWERX Prime	04	U	164,648	83,336	20,580
43	0604015F	Long Range Strike - Bomber	04	U	3,037,499	2,984,143	2,654,073
44	0604025F	Rapid Defense Experimentation Reserve (RDER)	04	U	61,915	154,300	75,051
45	0604032F	Directed Energy Prototyping	04	U	4,202	1,246	3,712
46	0604033F	Hypersonics Prototyping	04	U	112,015	150,340	
47	0604183F	Hypersonics Prototyping - Hypersonic Attack Cruise Missile (HACM)	04	U	387,325	381,528	516,971
48	0604201F	PNT Resiliency, Mods, and Improvements	04	U	28,902	18,041	
49	0604257F	Advanced Technology and Sensors	04	U	12,311	27,650	24,204
50	0604288F	Survivable Airborne Operations Center (SAOC)	04	U	94,740	888,829	1,687,500
51	0604317F	Technology Transfer	04	U	34,986	26,638	3,485
52	0604327F	Hard and Deeply Buried Target Defeat System (HDBTDS) Program	04	U	113,552	19,266	154,417
53	0604414F	Cyber Resiliency of Weapon Systems-ACS	04	U	42,068	37,121	59,539
54	0604534F	Adaptive Engine Transition Program (AETP)	04	U	276,659		

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
55	0604609F	Requirements Analysis & Concept Maturation	04	U			22,667
56	0604668F	Joint Transportation Management System (JTMS)	04	U	27,758	37,026	174,723
57	0604776F	Deployment & Distribution Enterprise R&D	04	U	27,586	31,833	4,840
58	0604858F	Tech Transition Program	04	U	298,057	210,806	234,342
59	0604860F	Operational Energy and Installation Resilience	04	U	24,603	46,305	63,194
60	0605057F	Next Generation Air-refueling System	04	U			7,014
61	0605164F	Air Refueling Capability Modernization	04	U	11,281	19,400	13,661
62	0606005F	Digital Transformation Office	04	U			9,800
63	0201184F	Counter Narco-Terrorism Program Office	04	U	2		
64	0207110F	Next Generation Air Dominance	04	U	1,608,787	2,326,128	3,306,355
65	0207179F	Autonomous Collaborative Platforms	04	U	54,954	118,826	51,666
66	0207420F	Combat Identification	04	U	1,866	1,902	1,914
67	0207431F	Combat Air Intelligence System Activities	04	U			18,733
68	0207448F	C2ISR Tactical Data Link	04	U			42,371
69	0207455F	Three Dimensional Long-Range Radar (3DELRR)	04	U	13,959	19,763	8,100
70	0207522F	Airbase Air Defense Systems (ABADS)	04	U	48,252	78,867	17,273
71	0207606F	Joint Simulation Environment (JSE)	04	U			191,337
72	0208030F	War Reserve Materiel - Ammunition	04	U	10,288	8,175	5,226
73	0305236F	Common Data Link Executive Agent (CDL EA)	04	U	37,460	25,157	33,349
74	0305601F	Mission Partner Environments	04	U	16,741	17,727	22,028

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
75	0306250F	Cyber Operations Technology Support	04	U	272,583		
76	0306415F	Enabled Cyber Activities	04	U	16,728		
77	0708051F	Rapid Sustainment Modernization (RSM)	04	U	69,000	43,431	37,044
78	0808736F	Special Victim Accountability and Investigation	04	U			3,006
79	0808737F	Integrated Primary Prevention	04	U	8,973	9,364	5,364
80	0901410F	Contracting Information Technology System	04	U	13,630	28,294	28,995
81	1206415F	U.S. Space Command Research and Development Support	04	U	8,350	14,892	28,392
<b>Advanced Component Development &amp; Prototypes</b>					<b>8,086,618</b>	<b>9,859,030</b>	<b>11,486,204</b>
82	0604200F	Future Advanced Weapon Analysis & Programs	05	U	11,641	9,757	7,205
83	0604201F	PNT Resiliency, Mods, and Improvements	05	U	170,057	163,156	217,662
84	0604222F	Nuclear Weapons Support	05	U	61,736	45,884	70,823
85	0604270F	Electronic Warfare Development	05	U	8,352	13,804	19,264
86	0604281F	Tactical Data Networks Enterprise	05	U	120,186	74,023	78,480
87	0604287F	Physical Security Equipment Hard and Deeply Buried Target Defeat System (HDBTDS)	05	U	6,664	10,605	10,569
88	0604336F	Prototyping	05	U			39,079
89	0604602F	Armament/Ordnance Development	05	U	6,120	5,918	7,157
90	0604604F	Submunitions	05	U	3,273	3,345	3,427
91	0604617F	Agile Combat Support	05	U	18,677	21,967	24,178
92	0604706F	Life Support Systems	05	U	32,820	39,301	25,502

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
93	0604735F	Combat Training Ranges	05	U	100,322	152,569	224,783
94	0604932F	Long Range Standoff Weapon	05	U	921,891	911,406	623,491
95	0604933F	ICBM Fuze Modernization	05	U	97,499	71,732	10,408
96	0605030F	Joint Tactical Network Center (JTNC)	05	U	2,222	2,256	
97	0605031F	Joint Tactical Network (JTN)	05	U		452	
98	0605056F	Open Architecture Management	05	U	37,262	36,582	41,223
99	0605057F	Next Generation Air-refueling System	05	U		7,928	
100	0605223F	Advanced Pilot Training	05	U	32,513	77,252	83,985
101	0605229F	HH-60W	05	U	27,722	48,268	
102	0605238F	Ground Based Strategic Deterrent EMD	05	U	3,434,623	3,746,935	3,721,024
103	0207171F	F-15 EPAWSS	05	U	65,587	13,982	
104	0207279F	Isolated Personnel Survivability and Recovery	05	U	9,591	56,225	10,020
105	0207328F	Stand In Attack Weapon	05	U	243,076	298,585	375,528
106	0207701F	Full Combat Mission Training	05	U	12,528	7,597	7,754
107	0208036F	Medical C-CBRNE Programs	05	U		2,006	
108	0303267F	Auctioned Spectrum Relocation Fund	05	U	60,167		
109	0303667F	Citizen Broadband Radio System	05	U	8		
110	0303867F	AMBIT - Post-Auctioned SRF	05	U	14,851		
111	0305155F	Theater Nuclear Weapon Storage & Security System	05	U			9,018
112	0305205F	Endurance Unmanned Aerial Vehicles	05	U		30,000	

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
113	0401221F	KC-46A Tanker Squadrons	05	U	140,395	124,662	93,620
114	0401319F	VC-25B	05	U	79,623	490,701	433,943
115	0701212F	Automated Test Systems	05	U	16,657	12,911	26,640
116	0804772F	Training Developments	05	U	10,838	1,922	4,960
117	1203176F	Combat Survivor Evader Locator	05	U			2,269
<b>System Development &amp; Demonstration</b>					<b>5,746,901</b>	<b>6,481,731</b>	<b>6,172,012</b>
118	0604256F	Threat Simulator Development	06	U	20,835	16,626	19,927
119	0604759F	Major T&E Investment	06	U	169,432	31,143	74,228
120	0605101F	RAND Project Air Force	06	U	37,655	38,398	39,720
121	0605502F	Small Business Innovation Research	06	U	836,355	1,466	
122	0605712F	Initial Operational Test & Evaluation	06	U	13,926	13,736	14,247
123	0605807F	Test and Evaluation Support	06	U	842,401	913,213	936,913
124	0605827F	Acq Workforce- Global Vig & Combat Sys	06	U	288,812	317,901	316,924
125	0605828F	Acq Workforce- Global Reach	06	U	456,624	541,677	496,740
126	0605829F	Acq Workforce- Cyber, Network, & Bus Sys	06	U	471,073	551,213	521,987
127	0605830F	Acq Workforce- Global Battle Mgmt	06	U	3,696		
128	0605831F	Acq Workforce- Capability Integration	06	U	261,016	243,780	262,349
129	0605832F	Acq Workforce- Advanced Prgm Technology	06	U	64,081	109,030	69,319
130	0605833F	Acq Workforce- Nuclear Systems	06	U	236,382	336,788	343,180
131	0605898F	Management HQ - R&D	06	U	6,054	5,005	6,291

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
FY 2025 President's Budget  
Exhibit R-1 FY 2025 President's Budget  
Total Obligational Authority  
(Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
132	0605976F	Facilities Restoration and Modernization - Test and Evaluation Support	06	U	133,420	87,889	94,828
133	0605978F	Facilities Sustainment - Test and Evaluation Support	06	U	31,561	35,065	63,579
134	0606017F	Requirements Analysis and Maturation	06	U	106,454	89,956	41,550
135	0606398F	Management HQ - T&E	06	U	7,535	7,453	7,647
136	0303166F	Joint Information Operations Range	06	U	556		
137	0303255F	Command, Control, Communication, and Computers (C4) - STRATCOM	06	U	29,092	20,871	19,607
138	0308602F	ENTEPRISE INFORMATION SERVICES (EIS)	06	U	71,020	100,357	104,133
139	0702806F	Acquisition and Management Support	06	U	48,331	20,478	25,216
140	0804731F	General Skill Training	06	U	871	796	10
141	0804776F	Advanced Distributed Learning	06	U			1,652
142	0909999F	Financing for Cancelled Account Adjustments	06	U	1,887		
143	1001004F	International Activities	06	U	2,593	3,917	4,590
		<b>Management Support</b>			<b>4,141,662</b>	<b>3,486,758</b>	<b>3,464,637</b>
144	0604233F	Specialized Undergraduate Flight Training	07	U	16,729	41,464	39,667
145	0604281F	Tactical Data Networks Enterprise	07	U			22
146	0604283F	Battle Mgmt Com & Ctrl Sensor Development	07	U		40,000	100,183
147	0604445F	Wide Area Surveillance	07	U		8,018	21,443
148	0604617F	Agile Combat Support	07	U	7,937	5,645	
149	0604776F	Deployment & Distribution Enterprise R&D	07	U	156		

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
150	0604840F	F-35 C2D2	07	U	994,924	1,275,268	1,124,207
151	0605018F	AF Integrated Personnel and Pay System (AF-IPPS)	07	U	41,872	40,203	49,739
152	0605024F	Anti-Tamper Technology Executive Agency	07	U	49,908	49,613	65,792
153	0605117F	Foreign Materiel Acquisition and Exploitation	07	U	117,838	93,881	94,188
154	0605229F	HH-60W	07	U			52,314
155	0605278F	HC/MC-130 Recap RDT&E	07	U	47,174	36,536	24,934
156	0606018F	NC3 Integration	07	U	24,317	22,910	21,864
157	0101113F	B-52 Squadrons	07	U	701,934	950,815	1,045,570
158	0101122F	Air-Launched Cruise Missile (ALCM)	07	U	571	290	542
159	0101126F	B-1B Squadrons	07	U	19,456	12,619	17,939
160	0101127F	B-2 Squadrons	07	U	100,590	87,623	41,212
161	0101213F	Minuteman Squadrons	07	U	71,339	33,237	62,550
162	0101316F	Worldwide Joint Strategic Communications	07	U	17,894	24,653	13,690
163	0101318F	Service Support to STRATCOM - Global Strike	07	U		7,562	7,330
164	0101324F	Integrated Strategic Planning & Analysis Network	07	U	31,043		
165	0101328F	ICBM Reentry Vehicles	07	U	112,282	475,415	629,928
167	0102110F	MH-139A	07	U	15,805	25,737	
168	0102326F	Region/Sector Operation Control Center Modernization Program	07	U	389	831	852
169	0102412F	North Warning System (NWS)	07	U	231,884	102	103

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
170	0102417F	Over-the-Horizon Backscatter Radar	07	U	4,400	428,754	383,575
171	0202834F	Vehicles and Support Equipment - General	07	U	13,715	15,498	6,097
172	0205219F	MQ-9 UAV	07	U	144,827	81,123	7,074
173	0205671F	Joint Counter RCIED Electronic Warfare	07	U	3,901	2,303	3,372
174	0207040F	Multi-Platform Electronic Warfare Equipment	07	U	44,264	7,312	
175	0207131F	A-10 Squadrons	07	U	52,797		
176	0207133F	F-16 Squadrons	07	U	241,482	98,633	106,952
177	0207134F	F-15E Squadrons	07	U	193,307	50,965	178,603
178	0207136F	Manned Destructive Suppression	07	U	9,540	16,543	16,182
179	0207138F	F-22A Squadrons	07	U	542,659	725,889	768,561
180	0207142F	F-35 Squadrons	07	U	60,501	97,231	47,132
181	0207146F	F-15EX	07	U	91,178	100,006	56,228
182	0207161F	Tactical AIM Missiles	07	U	33,365	41,958	34,932
183	0207163F	Advanced Medium Range Air-to-Air Missile (AMRAAM)	07	U	36,055	53,679	53,593
184	0207227F	Combat Rescue - Pararescue	07	U	863	726	743
185	0207238F	E-11A	07	U		64,888	64,127
186	0207247F	AF TENCAP	07	U	28,809	25,749	50,263
187	0207249F	Precision Attack Systems Procurement	07	U	12,284	11,872	12,723
188	0207253F	Compass Call	07	U	54,758	66,932	132,475
189	0207268F	Aircraft Engine Component Improvement Program	07	U	131,325	55,223	68,743

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.



Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
190	0207325F	Joint Air-to-Surface Standoff Missile (JASSM)	07	U	123,852	132,937	183,532
191	0207327F	Small Diameter Bomb (SDB)	07	U	37,988	37,518	29,910
192	0207410F	Air & Space Operations Center (AOC)	07	U	76,216	72,059	71,442
193	0207412F	Control and Reporting Center (CRC)	07	U	6,409	17,498	18,473
194	0207417F	Airborne Warning and Control System (AWACS)	07	U	11,191		
195	0207418F	AFSPECWAR - TACP	07	U	5,763	2,106	2,206
197	0207431F	Combat Air Intelligence System Activities	07	U	36,704	72,010	46,702
198	0207438F	Theater Battle Management (TBM) C4I	07	U	5,647	6,467	4,873
199	0207439F	Electronic Warfare Integrated Reprogramming (EWIR)	07	U	15,990	10,388	17,149
200	0207444F	Tactical Air Control Party-Mod	07	U	10,008	10,060	12,171
201	0207452F	DCAPES	07	U	7,754	8,233	8,431
202	0207521F	Air Force Calibration Programs	07	U	20,226	2,172	2,223
203	0207573F	National Technical Nuclear Forensics	07	U	2,039	2,049	2,060
204	0207590F	Seek Eagle	07	U	32,794	33,478	34,985
205	0207601F	USAF Modeling and Simulation	07	U	20,980		
206	0207605F	Wargaming and Simulation Centers	07	U	7,004	11,894	
207	0207697F	Distributed Training and Exercises	07	U	4,480	3,811	4,847
208	0207701F	Full Combat Mission Training	07	U			7,048
209	0208006F	Mission Planning Systems	07	U	96,492	96,272	92,566
210	0208007F	Tactical Deception	07	U	32,343	26,533	539

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
211	0208064F	OPERATIONAL HQ - CYBER	07	U	13,841		
212	0208087F	Distributed Cyber Warfare Operations	07	U	69,414	50,122	29,996
213	0208088F	AF Defensive Cyberspace Operations	07	U	16,220	113,064	113,218
214	0208097F	Joint Cyber Command and Control (JCC2)	07	U	86,631		
215	0208099F	Unified Platform (UP)	07	U	103,792		
219	0208288F	Intel Data Applications	07	U	1,026	967	988
220	0301025F	GeoBase	07	U	2,256	1,514	1,002
221	0301112F	Nuclear Planning and Execution System (NPES)	07	U	17,276		
222	0301113F	Cyber Security Intelligence Support	07	U	8,972	8,476	18,141
228	0301377F	Countering Advanced Conventional Weapons (CACW)	07	U			1,668
230	0301401F	AF Multi-Domain Non-Traditional ISR Battlespace Awareness	07	U	3,069	2,890	3,436
231	0302015F	E-4B National Airborne Operations Center (NAOC)	07	U	29,425	39,868	40,441
232	0302315F	Non-Kinetic Countermeasure Support	07	U			15,180
233	0303004F	EIT CONNECT	07	U		32,900	32,960
234	0303089F	Cyberspace and DoDIN Operations	07	U		4,881	9,776
235	0303131F	Minimum Essential Emergency Communications Network (MEECN)	07	U	32,876	33,567	25,500
236	0303133F	High Frequency Radio Systems	07	U	2,315	40,000	8,667
237	0303140F	Information Systems Security Program	07	U	63,048	95,523	94,424
238	0303248F	All Domain Common Platform	07	U	44,989	71,296	82,927

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
239	0303260F	Joint Military Deception Initiative	07	U	2,493	4,682	7,324
240	0304100F	Strategic Mission Planning & Execution System (SMPES)	07	U		64,944	69,441
243	0304260F	Airborne SIGINT Enterprise	07	U	98,297	108,947	85,284
244	0304310F	Commercial Economic Analysis	07	U	4,054	4,635	4,719
247	0305015F	C2 Air Operations Suite - C2 Info Services	07	U	7,499	13,751	13,524
248	0305020F	CCMD Intelligence Information Technology	07	U	1,821	1,660	1,836
249	0305022F	ISR Modernization & Automation Dvmt (IMAD)	07	U	15,138	18,680	22,909
250	0305099F	Global Air Traffic Management (GATM)	07	U	4,727	5,031	5,151
251	0305103F	Cyber Security Initiative	07	U	87	301	304
252	0305111F	Weather Service	07	U	52,060	26,329	31,372
253	0305114F	Air Traffic Control, Approach, and Landing System (ATCALs)	07	U	6,729	8,751	15,143
254	0305116F	Aerial Targets	07	U	1,316	6,915	7,685
257	0305128F	Security and Investigative Activities	07	U	214	352	481
258	0305146F	Defense Joint Counterintelligence Activities	07	U	8,328	6,930	6,387
259	0305158F	Tactical Terminal	07	U			1,002
260	0305179F	Integrated Broadcast Service (IBS)	07	U	14,123	21,588	16,006
261	0305202F	Dragon U-2	07	U	35,170	16,842	
262	0305206F	Airborne Reconnaissance Systems	07	U	76,139	43,158	84,363
263	0305207F	Manned Reconnaissance Systems	07	U	14,590	14,330	16,323

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
264	0305208F	Distributed Common Ground/Surface Systems	07	U	26,901	88,854	86,476
265	0305220F	RQ-4 UAV	07	U	36,791	1,242	9,516
266	0305221F	Network-Centric Collaborative Targeting	07	U	17,564	12,496	8,952
267	0305238F	NATO AGS	07	U	826	2	865
268	0305240F	Support to DCGS Enterprise	07	U	28,774	31,589	30,932
269	0305600F	International Intelligence Technology and Architectures	07	U	25,036	15,322	18,670
270	0305881F	Rapid Cyber Acquisition	07	U	3,636	8,830	
271	0305984F	Personnel Recovery Command & Ctrl (PRC2)	07	U	3,123	2,764	2,831
272	0307577F	Intelligence Mission Data (IMD)	07	U	6,332	7,090	3,658
273	0401115F	C-130 Airlift Squadron	07	U	392	5,427	
274	0401119F	C-5 Airlift Squadrons (IF)	07	U	3,095	29,502	33,003
275	0401130F	C-17 Aircraft (IF)	07	U	25,387	2,753	17,395
276	0401132F	C-130J Program	07	U	9,782	19,100	34,423
277	0401134F	Large Aircraft IR Countermeasures (LAIRCM)	07	U	2,820	5,982	7,768
278	0401218F	KC-135s	07	U	18,409	51,105	31,977
279	0401318F	CV-22	07	U	9,678	18,127	26,249
280	0408011F	Special Tactics / Combat Control	07	U	6,163	9,198	9,421
281	0708055F	Maintenance, Repair & Overhaul System	07	U	18,313		
282	0708610F	Logistics Information Technology (LOGIT)	07	U	15,882	17,520	11,895

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments'	Request
283	0801380F	AF LVC Operational Training (LVC-OT)	07	U		25,144	29,815
284	0804743F	Other Flight Training	07	U	1,908	2,265	2,319
285	0901202F	Joint Personnel Recovery Agency	07	U	1,805	2,266	2,320
286	0901218F	Civilian Compensation Program	07	U	3,461	4,006	4,267
287	0901220F	Personnel Administration	07	U	2,883	3,078	3,163
288	0901226F	Air Force Studies and Analysis Agency	07	U	866	5,309	18,937
289	0901538F	Financial Management Information Systems Development	07	U	4,922	4,279	5,634
290	0901554F	Defense Enterprise Acntng and Mgt Sys (DEAMS)	07	U	43,111	45,925	57,689
291	1202140F	Service Support to SPACECOM Activities	07	U	13,418	9,778	
999	999999999	Classified Programs	07	U	17,634,854	16,814,245	18,038,552
	<b>Operational Systems Development</b>				<b>23,662,019</b>	<b>23,829,283</b>	<b>25,308,906</b>
293	0901560F	Continuing Resolution Programs	20	U		-1,651,372	
	<b>Undistributed</b>					<b>-1,651,372</b>	
<b>Total Research, Development, Test and Evaluation, Air Force</b>					<b>45,014,265</b>	<b>44,913,984</b>	<b>49,108,771</b>

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

UNCLASSIFIED

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

Appropriation: 3600F Research, Development, Test and Evaluation, Air Force

Line No	Program Element Number	Item	Act	Sec	FY 2024 PB	FY 2025
					Request Overseas Operations Costs (OOC)*	Request Overseas Operations Costs (OOC)*
86	0604281F	Tactical Data Networks Enterprise	05	U	1,792	1,831
		<b>System Development &amp; Demonstration</b>			<b>1,792</b>	<b>1,831</b>
219	0208288F	Intel Data Applications	07	U	967	988
		<b>Operational Systems Development</b>			<b>967</b>	<b>988</b>
<b>Total Research, Development, Test and Evaluation, Air Force</b>					<b>2,759</b>	<b>2,819</b>

\*FY 2024 and FY 2025 Overseas Operations Costs (OOC) numbers are a subset of the baseline submission.

\*FY 2023 includes \$0K in Overseas Operations Costs (OOC) Actuals. FY 2024 includes \$2,759K in OOC Requested. FY 2025 includes \$2,819K for the OOC Budget Estimate. OOC were financed previously with former Overseas Contingency Operations (OCO) funding.

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

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

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
1	01	0601102F	Defense Research Sciences.....	Volume 1 - 1
2	01	0601103F	University Research Initiatives.....	Volume 1 - 23

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
3	02	0602020F	Future AF Capabilities Applied Research.....	Volume 1 - 29
4	02	0602022F	University Affiliated Research Center (UARC) - Tactical Autonomy.....	Volume 1 - 37
5	02	0602102F	Materials.....	Volume 1 - 41
6	02	0602201F	Aerospace Vehicle Technologies.....	Volume 1 - 61
7	02	0602202F	Human Effectiveness Applied Research.....	Volume 1 - 79
8	02	0602203F	Aerospace Propulsion.....	Volume 1 - 103
9	02	0602204F	Aerospace Sensors.....	Volume 1 - 139
10	02	0602212F	Defense Laboratories R&D Projects (10 U.S.C, Sec 2358).....	Volume 1 - 167

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
11	02	0602298F	Science and Technology Management - Major Headquarters Activities.....	Volume 1 - 169
12	02	0602602F	Conventional Munitions.....	Volume 1 - 171
13	02	0602605F	Directed Energy Technology.....	Volume 1 - 183
14	02	0602788F	Dominant Information Sciences and Methods.....	Volume 1 - 193

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
15	03	0603032F	Future AF Integrated Technology Demos.....	Volume 1 - 211
16	03	0603112F	Advanced Materials for Weapon Systems.....	Volume 1 - 229
17	03	0603199F	Sustainment Science and Technology (S&T).....	Volume 1 - 239
18	03	0603203F	Advanced Aerospace Sensors.....	Volume 1 - 243
19	03	0603211F	Aerospace Technology Dev/Demo.....	Volume 1 - 255
20	03	0603216F	Aerospace Propulsion and Power Technology.....	Volume 1 - 273
21	03	0603270F	Electronic Combat Technology.....	Volume 1 - 287
22	03	0603273F	Science & Technology for Nuclear Re-entry Systems.....	Volume 1 - 301
23	03	0603444F	Maui Space Surveillance System (MSSS).....	Volume 1 - 309

**UNCLASSIFIED**



**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
24	03	0603456F	Human Effectiveness Advanced Technology Development.....	Volume 1 - 311
25	03	0603601F	Conventional Weapons Technology.....	Volume 1 - 325
26	03	0603605F	Advanced Weapons Technology.....	Volume 1 - 333
27	03	0603680F	Manufacturing Technology Program.....	Volume 1 - 339
28	03	0603788F	Battlespace Knowledge Development and Demonstration.....	Volume 1 - 349
29	03	0604776F	Deployment & Distribution Enterprise R&D.....	Volume 1 - 361
30	03	0207412F	Control and Reporting Center (CRC).....	Volume 1 - 373

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
31	04	0603036F	Modular Advanced Missile.....	Volume 2 - 1
32	04	0603260F	Intelligence Advanced Development.....	Volume 2 - 7
33	04	0603742F	Combat Identification Technology.....	Volume 2 - 19
34	04	0603790F	NATO Research and Development.....	Volume 2 - 43
35	04	0603851F	Intercontinental Ballistic Missile - Dem/Val.....	Volume 2 - 49
36	04	0604001F	NC3 Advanced Concepts.....	Volume 2 - 73

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
37	04	0604003F	Advanced Battle Management System (ABMS).....	Volume 2 - 79
38	04	0604004F	Advanced Engine Development.....	Volume 2 - 101
39	04	0604005F	NC3 Commercial Development & Prototyping.....	Volume 2 - 109
40	04	0604006F	Dept of the Air Force Tech Architecture.....	Volume 2 - 117
41	04	0604007F	E-7.....	Volume 2 - 127
42	04	0604009F	AFWERX Prime.....	Volume 2 - 135
43	04	0604015F	Long Range Strike - Bomber.....	Volume 2 - 151
44	04	0604025F	Rapid Defense Experimentation Reserve (RDER).....	Volume 2 - 163
45	04	0604032F	Directed Energy Prototyping.....	Volume 2 - 177
46	04	0604033F	Hypersonics Prototyping.....	Volume 2 - 183
47	04	0604183F	Hypersonics Prototyping - Hypersonic Attack Cruise Missile (HACM).....	Volume 2 - 191
48	04	0604201F	PNT Resiliency, Mods, and Improvements.....	Volume 2 - 201
49	04	0604257F	Advanced Technology and Sensors.....	Volume 2 - 209
50	04	0604288F	Survivable Airborne Operations Center (SAOC).....	Volume 2 - 223
51	04	0604317F	Technology Transfer.....	Volume 2 - 231
52	04	0604327F	Hard and Deeply Buried Target Defeat System (HDBTDS) Program.....	Volume 2 - 249
53	04	0604414F	Cyber Resiliency of Weapon Systems-ACS.....	Volume 2 - 257
54	04	0604534F	Adaptive Engine Transition Program (AETP).....	Volume 2 - 277

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
55	04	0604609F	Requirements Analysis & Concept Maturation.....	Volume 2 - 283
56	04	0604668F	Joint Transportation Management System (JTMS).....	Volume 2 - 303
57	04	0604776F	Deployment & Distribution Enterprise R&D.....	Volume 2 - 309
58	04	0604858F	Tech Transition Program.....	Volume 2 - 349
59	04	0604860F	Operational Energy and Installation Resilience.....	Volume 2 - 387
60	04	0605057F	Next Generation Air-refueling System.....	Volume 2 - 409
61	04	0605164F	Air Refueling Capability Modernization.....	Volume 2 - 415
62	04	0606005F	Digital Transformation Office.....	Volume 2 - 421
64	04	0207110F	Next Generation Air Dominance.....	Volume 2 - 427
65	04	0207179F	Autonomous Collaborative Platforms.....	Volume 2 - 439
66	04	0207420F	Combat Identification.....	Volume 2 - 457
67	04	0207431F	Combat Air Intelligence System Activities.....	Volume 2 - 463
68	04	0207448F	C2ISR Tactical Data Link.....	Volume 2 - 469
69	04	0207455F	Three Dimensional Long-Range Radar (3DELRR).....	Volume 2 - 475
70	04	0207522F	Airbase Air Defense Systems (ABADS).....	Volume 2 - 483
71	04	0207606F	Joint Simulation Environment (JSE).....	Volume 2 - 493
72	04	0208030F	War Reserve Materiel - Ammunition.....	Volume 2 - 501
73	04	0305236F	Common Data Link Executive Agent (CDL EA).....	Volume 2 - 509

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
74	04	0305601F	Mission Partner Environments.....	Volume 2 - 523
75	04	0306250F	Cyber Operations Technology Support.....	Volume 2 - 529
76	04	0306415F	Enabled Cyber Activities.....	Volume 2 - 537
77	04	0708051F	Rapid Sustainment Modernization (RSM).....	Volume 2 - 543
78	04	0808736F	Special Victim Accountability and Investigation.....	Volume 2 - 551
79	04	0808737F	Integrated Primary Prevention.....	Volume 2 - 559
80	04	0901410F	Contracting Information Technology System.....	Volume 2 - 569
81	04	1206415F	U.S. Space Command Research and Development Support.....	Volume 2 - 579

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
82	05	0604200F	Future Advanced Weapon Analysis & Programs.....	Volume 2 - 589
83	05	0604201F	PNT Resiliency, Mods, and Improvements.....	Volume 2 - 599
84	05	0604222F	Nuclear Weapons Support.....	Volume 2 - 609
85	05	0604270F	Electronic Warfare Development.....	Volume 2 - 633
86	05	0604281F	Tactical Data Networks Enterprise.....	Volume 2 - 647

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
87	05	0604287F	Physical Security Equipment.....	Volume 2 - 663
88	05	0604336F	Hard and Deeply Buried Target Defeat System (HDBTDS) Prototyping.....	Volume 2 - 671
89	05	0604602F	Armament/Ordnance Development.....	Volume 2 - 677
90	05	0604604F	Submunitions.....	Volume 2 - 701
91	05	0604617F	Agile Combat Support.....	Volume 2 - 709
92	05	0604706F	Life Support Systems.....	Volume 2 - 725
93	05	0604735F	Combat Training Ranges.....	Volume 2 - 733
94	05	0604932F	Long Range Standoff Weapon.....	Volume 2 - 745
95	05	0604933F	ICBM Fuze Modernization.....	Volume 2 - 757
96	05	0605030F	Joint Tactical Network Center (JTNC).....	Volume 2 - 765
97	05	0605031F	Joint Tactical Network (JTN).....	Volume 2 - 773
98	05	0605056F	Open Architecture Management.....	Volume 2 - 781
99	05	0605057F	Next Generation Air-refueling System.....	Volume 2 - 793
100	05	0605223F	Advanced Pilot Training.....	Volume 2 - 799
101	05	0605229F	HH-60W.....	Volume 2 - 807
102	05	0605238F	Ground Based Strategic Deterrent EMD.....	Volume 2 - 817
103	05	0207171F	F-15 EPAWSS.....	Volume 2 - 837
104	05	0207279F	Isolated Personnel Survivability and Recovery.....	Volume 2 - 845

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
105	05	0207328F	Stand In Attack Weapon.....	Volume 2 - 853
106	05	0207701F	Full Combat Mission Training.....	Volume 2 - 863
107	05	0208036F	Medical C-CBRNE Programs.....	Volume 2 - 877
108	05	0303267F	Auctioned Spectrum Relocation Fund.....	Volume 2 - 883
109	05	0303667F	Citizen Broadband Radio System.....	Volume 2 - 889
110	05	0303867F	AMBIT - Post-Auctioned SRF.....	Volume 2 - 895
111	05	0305155F	Theater Nuclear Weapon Storage & Security System.....	Volume 2 - 901
112	05	0305205F	Endurance Unmanned Aerial Vehicles.....	Volume 2 - 907
113	05	0401221F	KC-46A Tanker Squadrons.....	Volume 2 - 913
114	05	0401319F	VC-25B.....	Volume 2 - 933
115	05	0701212F	Automated Test Systems.....	Volume 2 - 941
116	05	0804772F	Training Developments.....	Volume 2 - 955
117	05	1203176F	Combat Survivor Evader Locator.....	Volume 2 - 967

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
118	06	0604256F	Threat Simulator Development.....	Volume 3 - 1
119	06	0604759F	Major T&E Investment.....	Volume 3 - 11
120	06	0605101F	RAND Project Air Force.....	Volume 3 - 17
121	06	0605502F	Small Business Innovation Research.....	Volume 3 - 25
122	06	0605712F	Initial Operational Test & Evaluation.....	Volume 3 - 29
123	06	0605807F	Test and Evaluation Support.....	Volume 3 - 35
124	06	0605827F	Acq Workforce- Global Vig & Combat Sys.....	Volume 3 - 43
125	06	0605828F	Acq Workforce- Global Reach.....	Volume 3 - 47
126	06	0605829F	Acq Workforce- Cyber, Network, & Bus Sys.....	Volume 3 - 53
127	06	0605830F	Acq Workforce- Global Battle Mgmt.....	Volume 3 - 61
128	06	0605831F	Acq Workforce- Capability Integration.....	Volume 3 - 63
129	06	0605832F	Acq Workforce- Advanced Prgm Technology.....	Volume 3 - 67
130	06	0605833F	Acq Workforce- Nuclear Systems.....	Volume 3 - 71
131	06	0605898F	Management HQ - R&D.....	Volume 3 - 75
132	06	0605976F	Facilities Restoration and Modernization - Test and Evaluation Support.....	Volume 3 - 79
133	06	0605978F	Facilities Sustainment - Test and Evaluation Support.....	Volume 3 - 85

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
134	06	0606017F	Requirements Analysis and Maturation.....	Volume 3 - 91
135	06	0606398F	Management HQ - T&E.....	Volume 3 - 101
136	06	0303166F	Support to Information Operations (IO) Capabilities.....	Volume 3 - 103
137	06	0303255F	Command, Control, Communication, and Computers (C4) - STRATCOM.....	Volume 3 - 107
138	06	0308602F	ENTEPRISE INFORMATION SERVICES (EIS).....	Volume 3 - 113
139	06	0702806F	Acquisition and Management Support.....	Volume 3 - 123
141	06	0804776F	Advanced Distributed Learning.....	Volume 3 - 131
142	06	0909999F	Financing for Cancelled Account Adjustments.....	Volume 3 - 133
143	06	1001004F	International Activities.....	Volume 3 - 135

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
144	07	0604233F	Specialized Undergraduate Flight Training.....	Volume 3 - 141
145	07	0604281F	Tactical Data Networks Enterprise.....	Volume 3 - 161
146	07	0604283F	Battle Mgmt Com & Ctrl Sensor Development.....	Volume 3 - 167
147	07	0604445F	Wide Area Surveillance.....	Volume 3 - 175

**UNCLASSIFIED**



**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
148	07	0604617F	Agile Combat Support.....	Volume 3 - 181
149	07	0604776F	Deployment & Distribution Enterprise R&D.....	Volume 3 - 189
150	07	0604840F	F-35 C2D2.....	Volume 3 - 195
151	07	0605018F	AF Integrated Personnel and Pay System (AF-IPPS).....	Volume 3 - 277
152	07	0605024F	Anti-Tamper Technology Executive Agency.....	Volume 3 - 287
153	07	0605117F	Foreign Materiel Acquisition and Exploitation.....	Volume 3 - 297
154	07	0605229F	HH-60W.....	Volume 3 - 305
155	07	0605278F	HC/MC-130 Recap RDT&E.....	Volume 3 - 315
156	07	0606018F	NC3 Integration.....	Volume 3 - 343
157	07	0101113F	B-52 Squadrons.....	Volume 3 - 351
158	07	0101122F	Air-Launched Cruise Missile (ALCM).....	Volume 3 - 415
159	07	0101126F	B-1B Squadrons.....	Volume 3 - 421
160	07	0101127F	B-2 Squadrons.....	Volume 3 - 429
161	07	0101213F	Minuteman Squadrons.....	Volume 3 - 447
162	07	0101316F	Worldwide Joint Strategic Communications.....	Volume 3 - 475
163	07	0101318F	Service Support to STRATCOM - Global Strike.....	Volume 3 - 485
164	07	0101324F	Integrated Strategic Planning & Analysis Network.....	Volume 3 - 493
165	07	0101328F	ICBM Reentry Vehicles.....	Volume 3 - 501

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
167	07	0102110F	MH-139A.....	Volume 3 - 519
168	07	0102326F	Region/Sector Operation Control Center Modernization Program.....	Volume 3 - 535
169	07	0102412F	North Warning System (NWS).....	Volume 3 - 541
170	07	0102417F	Over-the-Horizon Backscatter Radar.....	Volume 3 - 547
171	07	0202834F	Vehicles and Support Equipment - General.....	Volume 3 - 563
172	07	0205219F	MQ-9 UAV.....	Volume 3 - 571
173	07	0205671F	Joint Counter RCIED Electronic Warfare.....	Volume 3 - 593
174	07	0207040F	Multi-Platform Electronic Warfare Equipment.....	Volume 3 - 599
175	07	0207131F	A-10 Squadrons.....	Volume 3 - 607
176	07	0207133F	F-16 Squadrons.....	Volume 3 - 615
177	07	0207134F	F-15E Squadrons.....	Volume 3 - 629
178	07	0207136F	Manned Destructive Suppression.....	Volume 3 - 641
179	07	0207138F	F-22A Squadrons.....	Volume 3 - 649
180	07	0207142F	F-35 Squadrons.....	Volume 3 - 669
181	07	0207146F	F-15EX.....	Volume 3 - 693
182	07	0207161F	Tactical AIM Missiles.....	Volume 3 - 701
183	07	0207163F	Advanced Medium Range Air-to-Air Missile (AMRAAM).....	Volume 3 - 709
184	07	0207227F	Combat Rescue - Pararescue.....	Volume 3 - 717

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
185	07	0207238F	E-11A.....	Volume 3 - 723
186	07	0207247F	AF TENCAP.....	Volume 3 - 743
187	07	0207249F	Precision Attack Systems Procurement.....	Volume 3 - 751
188	07	0207253F	Compass Call.....	Volume 3 - 757
189	07	0207268F	Aircraft Engine Component Improvement Program.....	Volume 3 - 765
190	07	0207325F	Joint Air-to-Surface Standoff Missile (JASSM).....	Volume 3 - 781
191	07	0207327F	Small Diameter Bomb (SDB).....	Volume 3 - 791
192	07	0207410F	Air & Space Operations Center (AOC).....	Volume 3 - 801
193	07	0207412F	Control and Reporting Center (CRC).....	Volume 3 - 809
194	07	0207417F	Airborne Warning and Control System (AWACS).....	Volume 3 - 817
195	07	0207418F	AFSPECWAR - TACP.....	Volume 4 - 1
197	07	0207431F	Combat Air Intelligence System Activities.....	Volume 4 - 7
198	07	0207438F	Theater Battle Management (TBM) C4I.....	Volume 4 - 21
199	07	0207439F	Electronic Warfare Integrated Reprogramming (EWIR).....	Volume 4 - 27
200	07	0207444F	Tactical Air Control Party-Mod.....	Volume 4 - 35
201	07	0207452F	DCAPES.....	Volume 4 - 45
202	07	0207521F	Air Force Calibration Programs.....	Volume 4 - 61
203	07	0207573F	National Technical Nuclear Forensics.....	Volume 4 - 69

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
204	07	0207590F	Seek Eagle.....	Volume 4 - 75
205	07	0207601F	USAF Modeling and Simulation.....	Volume 4 - 85
206	07	0207605F	Wargaming and Simulation Centers.....	Volume 4 - 99
207	07	0207697F	Distributed Training and Exercises.....	Volume 4 - 109
208	07	0207701F	Full Combat Mission Training.....	Volume 4 - 117
209	07	0208006F	Mission Planning Systems.....	Volume 4 - 127
210	07	0208007F	Tactical Deception.....	Volume 4 - 145
211	07	0208064F	OPERATIONAL HQ - CYBER.....	Volume 4 - 153
212	07	0208087F	Distributed Cyber Warfare Operations.....	Volume 4 - 161
213	07	0208088F	AF Defensive Cyberspace Operations.....	Volume 4 - 173
214	07	0208097F	Joint Cyber Command and Control (JCC2).....	Volume 4 - 209
215	07	0208099F	Unified Platform (UP).....	Volume 4 - 217
219	07	0208288F	Intel Data Applications.....	Volume 4 - 225
220	07	0301025F	GeoBase.....	Volume 4 - 231
221	07	0301112F	Nuclear Planning and Execution System (NPES).....	Volume 4 - 237
222	07	0301113F	Cyber Security Intelligence Support.....	Volume 4 - 245
228	07	0301377F	Countering Advanced Conventional Weapons (CACW).....	Volume 4 - 251
230	07	0301401F	AF Multi-Domain Non-Traditional ISR Battlespace Awareness.....	Volume 4 - 257

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
231	07	0302015F	E-4B National Airborne Operations Center (NAOC).....	Volume 4 - 263
232	07	0302315F	Non-Kinetic Countermeasure Support.....	Volume 4 - 271
233	07	0303004F	EIT CONNECT.....	Volume 4 - 277
234	07	0303089F	Cyberspace Operations Systems.....	Volume 4 - 283
235	07	0303131F	Minimum Essential Emergency Communications Network (MEECN).....	Volume 4 - 289
236	07	0303133F	High Frequency Radio Systems.....	Volume 4 - 309
237	07	0303140F	Information Systems Security Program.....	Volume 4 - 317
238	07	0303248F	All Domain Common Platform.....	Volume 4 - 339
239	07	0303260F	Joint Military Deception Initiative.....	Volume 4 - 355
240	07	0304100F	Strategic Mission Planning & Execution System (SMPES).....	Volume 4 - 361
243	07	0304260F	Airborne SIGINT Enterprise.....	Volume 4 - 375
244	07	0304310F	Commercial Economic Analysis.....	Volume 4 - 397
247	07	0305015F	C2 Air Operations Suite - C2 Info Services.....	Volume 4 - 403
248	07	0305020F	CCMD Intelligence Information Technology.....	Volume 4 - 411
249	07	0305022F	ISR Modernization & Automation Dvmt (IMAD).....	Volume 4 - 417
250	07	0305099F	Global Air Traffic Management (GATM).....	Volume 4 - 429
251	07	0305103F	Cyber Security Initiative.....	Volume 4 - 437
252	07	0305111F	Weather Service.....	Volume 4 - 443

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
253	07	0305114F	Air Traffic Control, Approach, and Landing System (ATCALs).....	Volume 4 - 455
254	07	0305116F	Aerial Targets.....	Volume 4 - 467
257	07	0305128F	Security and Investigative Activities.....	Volume 4 - 477
258	07	0305146F	Defense Joint Counterintelligence Activities.....	Volume 4 - 483
259	07	0305158F	Tactical Terminal.....	Volume 4 - 489
260	07	0305179F	Integrated Broadcast Service (IBS).....	Volume 4 - 495
261	07	0305202F	Dragon U-2.....	Volume 4 - 505
262	07	0305206F	Airborne Reconnaissance Systems.....	Volume 4 - 513
263	07	0305207F	Manned Reconnaissance Systems.....	Volume 4 - 555
264	07	0305208F	Distributed Common Ground/Surface Systems.....	Volume 4 - 565
265	07	0305220F	RQ-4 UAV.....	Volume 4 - 577
266	07	0305221F	Network-Centric Collaborative Targeting.....	Volume 4 - 587
267	07	0305238F	NATO AGS.....	Volume 4 - 595
268	07	0305240F	Support to DCGS Enterprise.....	Volume 4 - 601
269	07	0305600F	International Intelligence Technology and Architectures.....	Volume 4 - 613
270	07	0305881F	Rapid Cyber Acquisition.....	Volume 4 - 621
271	07	0305984F	Personnel Recovery Command & Ctrl (PRC2).....	Volume 4 - 627
272	07	0307577F	Intelligence Mission Data (IMD).....	Volume 4 - 635

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
273	07	0401115F	C-130 Airlift Squadron.....	Volume 4 - 641
274	07	0401119F	C-5 Airlift Squadrons (IF).....	Volume 4 - 649
275	07	0401130F	C-17 Aircraft (IF).....	Volume 4 - 663
276	07	0401132F	C-130J Program.....	Volume 4 - 671
277	07	0401134F	Large Aircraft IR Countermeasures (LAIRCM).....	Volume 4 - 687
278	07	0401218F	KC-135s.....	Volume 4 - 695
279	07	0401318F	CV-22.....	Volume 4 - 707
280	07	0408011F	Special Tactics / Combat Control.....	Volume 4 - 715
281	07	0708055F	Maintenance, Repair & Overhaul System.....	Volume 4 - 725
282	07	0708610F	Logistics Information Technology (LOGIT).....	Volume 4 - 735
283	07	0801380F	AF LVC Operational Training (LVC-OT).....	Volume 4 - 747
284	07	0804743F	Other Flight Training.....	Volume 4 - 763
285	07	0901202F	Joint Personnel Recovery Agency.....	Volume 4 - 769
286	07	0901218F	Civilian Compensation Program.....	Volume 4 - 775
287	07	0901220F	Personnel Administration.....	Volume 4 - 781
288	07	0901226F	Air Force Studies and Analysis Agency.....	Volume 4 - 791
289	07	0901538F	Financial Management Information Systems Development.....	Volume 4 - 797
290	07	0901554F	Defense Enterprise Acntng and Mgt Sys (DEAMS).....	Volume 4 - 807

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

***Appropriation 3600: Research, Development, Test & Evaluation, Air Force***

---

<b>Line #</b>	<b>Budget Activity</b>	<b>Program Element Number</b>	<b>Program Element Title</b>	<b>Page</b>
291	07	1202140F	Service Support to SPACECOM Activities.....	Volume 4 - 817

**UNCLASSIFIED**



**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

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

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
A-10 Squadrons	0207131F	175	07.....	Volume 3 - 607
AF Defensive Cyberspace Operations	0208088F	213	07.....	Volume 4 - 173
AF Integrated Personnel and Pay System (AF-IPPS)	0605018F	151	07.....	Volume 3 - 277
AF LVC Operational Training (LVC-OT)	0801380F	283	07.....	Volume 4 - 747
AF Multi-Domain Non-Traditional ISR Battlespace Awareness	0301401F	230	07.....	Volume 4 - 257
AF TENCAP	0207247F	186	07.....	Volume 3 - 743
AFSPECWAR - TACP	0207418F	195	07.....	Volume 4 - 1
AFWERX Prime	0604009F	42	04.....	Volume 2 - 135
AMBIT - Post-Auctioned SRF	0303867F	110	05.....	Volume 2 - 895
Acq Workforce- Advanced Prgm Technology	0605832F	129	06.....	Volume 3 - 67
Acq Workforce- Capability Integration	0605831F	128	06.....	Volume 3 - 63
Acq Workforce- Cyber, Network, & Bus Sys	0605829F	126	06.....	Volume 3 - 53
Acq Workforce- Global Battle Mgmt	0605830F	127	06.....	Volume 3 - 61
Acq Workforce- Global Reach	0605828F	125	06.....	Volume 3 - 47
Acq Workforce- Global Vig & Combat Sys	0605827F	124	06.....	Volume 3 - 43
Acq Workforce- Nuclear Systems	0605833F	130	06.....	Volume 3 - 71
Acquisition and Management Support	0702806F	139	06.....	Volume 3 - 123

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Adaptive Engine Transition Program (AETP)	0604534F	54	04.....	Volume 2 - 277
Advanced Aerospace Sensors	0603203F	18	03.....	Volume 1 - 243
Advanced Battle Management System (ABMS)	0604003F	37	04.....	Volume 2 - 79
Advanced Distributed Learning	0804776F	141	06.....	Volume 3 - 131
Advanced Engine Development	0604004F	38	04.....	Volume 2 - 101
Advanced Materials for Weapon Systems	0603112F	16	03.....	Volume 1 - 229
Advanced Medium Range Air-to-Air Missile (AMRAAM)	0207163F	183	07.....	Volume 3 - 709
Advanced Pilot Training	0605223F	100	05.....	Volume 2 - 799
Advanced Technology and Sensors	0604257F	49	04.....	Volume 2 - 209
Advanced Weapons Technology	0603605F	26	03.....	Volume 1 - 333
Aerial Targets	0305116F	254	07.....	Volume 4 - 467
Aerospace Propulsion	0602203F	8	02.....	Volume 1 - 103
Aerospace Propulsion and Power Technology	0603216F	20	03.....	Volume 1 - 273
Aerospace Sensors	0602204F	9	02.....	Volume 1 - 139
Aerospace Technology Dev/Demo	0603211F	19	03.....	Volume 1 - 255
Aerospace Vehicle Technologies	0602201F	6	02.....	Volume 1 - 61
Agile Combat Support	0604617F	91	05.....	Volume 2 - 709
Agile Combat Support	0604617F	148	07.....	Volume 3 - 181
Air & Space Operations Center (AOC)	0207410F	192	07.....	Volume 3 - 801

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Air Force Calibration Programs	0207521F	202	07.....	Volume 4 - 61
Air Force Studies and Analysis Agency	0901226F	288	07.....	Volume 4 - 791
Air Refueling Capability Modernization	0605164F	61	04.....	Volume 2 - 415
Air Traffic Control, Approach, and Landing System (ATCAL)	0305114F	253	07.....	Volume 4 - 455
Air-Launched Cruise Missile (ALCM)	0101122F	158	07.....	Volume 3 - 415
Airbase Air Defense Systems (ABADS)	0207522F	70	04.....	Volume 2 - 483
Airborne Reconnaissance Systems	0305206F	262	07.....	Volume 4 - 513
Airborne SIGINT Enterprise	0304260F	243	07.....	Volume 4 - 375
Airborne Warning and Control System (AWACS)	0207417F	194	07.....	Volume 3 - 817
Aircraft Engine Component Improvement Program	0207268F	189	07.....	Volume 3 - 765
All Domain Common Platform	0303248F	238	07.....	Volume 4 - 339
Anti-Tamper Technology Executive Agency	0605024F	152	07.....	Volume 3 - 287
Armament/Ordnance Development	0604602F	89	05.....	Volume 2 - 677
Auctioned Spectrum Relocation Fund	0303267F	108	05.....	Volume 2 - 883
Automated Test Systems	0701212F	115	05.....	Volume 2 - 941
Autonomous Collaborative Platforms	0207179F	65	04.....	Volume 2 - 439
B-1B Squadrons	0101126F	159	07.....	Volume 3 - 421
B-2 Squadrons	0101127F	160	07.....	Volume 3 - 429
B-52 Squadrons	0101113F	157	07.....	Volume 3 - 351

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Battle Mgmt Com & Ctrl Sensor Development	0604283F	146	07.....	Volume 3 - 167
Battlespace Knowledge Development and Demonstration	0603788F	28	03.....	Volume 1 - 349
C-130 Airlift Squadron	0401115F	273	07.....	Volume 4 - 641
C-130J Program	0401132F	276	07.....	Volume 4 - 671
C-17 Aircraft (IF)	0401130F	275	07.....	Volume 4 - 663
C-5 Airlift Squadrons (IF)	0401119F	274	07.....	Volume 4 - 649
C2 Air Operations Suite - C2 Info Services	0305015F	247	07.....	Volume 4 - 403
C2ISR Tactical Data Link	0207448F	68	04.....	Volume 2 - 469
CCMD Intelligence Information Technology	0305020F	248	07.....	Volume 4 - 411
CV-22	0401318F	279	07.....	Volume 4 - 707
Citizen Broadband Radio System	0303667F	109	05.....	Volume 2 - 889
Civilian Compensation Program	0901218F	286	07.....	Volume 4 - 775
Combat Air Intelligence System Activities	0207431F	67	04.....	Volume 2 - 463
Combat Air Intelligence System Activities	0207431F	197	07.....	Volume 4 - 7
Combat Identification	0207420F	66	04.....	Volume 2 - 457
Combat Identification Technology	0603742F	33	04.....	Volume 2 - 19
Combat Rescue - Pararescue	0207227F	184	07.....	Volume 3 - 717
Combat Survivor Evader Locator	1203176F	117	05.....	Volume 2 - 967
Combat Training Ranges	0604735F	93	05.....	Volume 2 - 733

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Command, Control, Communication, and Computers (C4) - STRATCOM	0303255F	137	06.....	Volume 3 - 107
Commercial Economic Analysis	0304310F	244	07.....	Volume 4 - 397
Common Data Link Executive Agent (CDL EA)	0305236F	73	04.....	Volume 2 - 509
Compass Call	0207253F	188	07.....	Volume 3 - 757
Contracting Information Technology System	0901410F	80	04.....	Volume 2 - 569
Control and Reporting Center (CRC)	0207412F	30	03.....	Volume 1 - 373
Control and Reporting Center (CRC)	0207412F	193	07.....	Volume 3 - 809
Conventional Munitions	0602602F	12	02.....	Volume 1 - 171
Conventional Weapons Technology	0603601F	25	03.....	Volume 1 - 325
Countering Advanced Conventional Weapons (CACW)	0301377F	228	07.....	Volume 4 - 251
Cyber Operations Technology Support	0306250F	75	04.....	Volume 2 - 529
Cyber Resiliency of Weapon Systems-ACS	0604414F	53	04.....	Volume 2 - 257
Cyber Security Initiative	0305103F	251	07.....	Volume 4 - 437
Cyber Security Intelligence Support	0301113F	222	07.....	Volume 4 - 245
Cyberspace Operations Systems	0303089F	234	07.....	Volume 4 - 283
DCAPES	0207452F	201	07.....	Volume 4 - 45
Defense Enterprise Acntng and Mgt Sys (DEAMS)	0901554F	290	07.....	Volume 4 - 807
Defense Joint Counterintelligence Activities	0305146F	258	07.....	Volume 4 - 483
Defense Laboratories R&D Projects (10 U.S.C, Sec 2358)	0602212F	10	02.....	Volume 1 - 167

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Defense Research Sciences	0601102F	1	01.....	Volume 1 - 1
Deployment & Distribution Enterprise R&D	0604776F	29	03.....	Volume 1 - 361
Deployment & Distribution Enterprise R&D	0604776F	57	04.....	Volume 2 - 309
Deployment & Distribution Enterprise R&D	0604776F	149	07.....	Volume 3 - 189
Dept of the Air Force Tech Architecture	0604006F	40	04.....	Volume 2 - 117
Digital Transformation Office	0606005F	62	04.....	Volume 2 - 421
Directed Energy Prototyping	0604032F	45	04.....	Volume 2 - 177
Directed Energy Technology	0602605F	13	02.....	Volume 1 - 183
Distributed Common Ground/Surface Systems	0305208F	264	07.....	Volume 4 - 565
Distributed Cyber Warfare Operations	0208087F	212	07.....	Volume 4 - 161
Distributed Training and Exercises	0207697F	207	07.....	Volume 4 - 109
Dominant Information Sciences and Methods	0602788F	14	02.....	Volume 1 - 193
Dragon U-2	0305202F	261	07.....	Volume 4 - 505
E-11A	0207238F	185	07.....	Volume 3 - 723
E-4B National Airborne Operations Center (NAOC)	0302015F	231	07.....	Volume 4 - 263
E-7	0604007F	41	04.....	Volume 2 - 127
EIT CONNECT	0303004F	233	07.....	Volume 4 - 277
ENTEPRISE INFORMATION SERVICES (EIS)	0308602F	138	06.....	Volume 3 - 113
Electronic Combat Technology	0603270F	21	03.....	Volume 1 - 287

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Electronic Warfare Development	0604270F	85	05.....	Volume 2 - 633
Electronic Warfare Integrated Reprogramming (EWIR)	0207439F	199	07.....	Volume 4 - 27
Enabled Cyber Activities	0306415F	76	04.....	Volume 2 - 537
Endurance Unmanned Aerial Vehicles	0305205F	112	05.....	Volume 2 - 907
F-15 EPAWSS	0207171F	103	05.....	Volume 2 - 837
F-15E Squadrons	0207134F	177	07.....	Volume 3 - 629
F-15EX	0207146F	181	07.....	Volume 3 - 693
F-16 Squadrons	0207133F	176	07.....	Volume 3 - 615
F-22A Squadrons	0207138F	179	07.....	Volume 3 - 649
F-35 C2D2	0604840F	150	07.....	Volume 3 - 195
F-35 Squadrons	0207142F	180	07.....	Volume 3 - 669
Facilities Restoration and Modernization - Test and Evaluation Support	0605976F	132	06.....	Volume 3 - 79
Facilities Sustainment - Test and Evaluation Support	0605978F	133	06.....	Volume 3 - 85
Financial Management Information Systems Development	0901538F	289	07.....	Volume 4 - 797
Financing for Cancelled Account Adjustments	0909999F	142	06.....	Volume 3 - 133
Foreign Materiel Acquisition and Exploitation	0605117F	153	07.....	Volume 3 - 297
Full Combat Mission Training	0207701F	106	05.....	Volume 2 - 863
Full Combat Mission Training	0207701F	208	07.....	Volume 4 - 117
Future AF Capabilities Applied Research	0602020F	3	02.....	Volume 1 - 29

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Future AF Integrated Technology Demos	0603032F	15	03.....	Volume 1 - 211
Future Advanced Weapon Analysis & Programs	0604200F	82	05.....	Volume 2 - 589
GeoBase	0301025F	220	07.....	Volume 4 - 231
Global Air Traffic Management (GATM)	0305099F	250	07.....	Volume 4 - 429
Ground Based Strategic Deterrent EMD	0605238F	102	05.....	Volume 2 - 817
HC/MC-130 Recap RDT&E	0605278F	155	07.....	Volume 3 - 315
HH-60W	0605229F	101	05.....	Volume 2 - 807
HH-60W	0605229F	154	07.....	Volume 3 - 305
Hard and Deeply Buried Target Defeat System (HDBTDS) Program	0604327F	52	04.....	Volume 2 - 249
Hard and Deeply Buried Target Defeat System (HDBTDS) Prototyping	0604336F	88	05.....	Volume 2 - 671
High Frequency Radio Systems	0303133F	236	07.....	Volume 4 - 309
Human Effectiveness Advanced Technology Development	0603456F	24	03.....	Volume 1 - 311
Human Effectiveness Applied Research	0602202F	7	02.....	Volume 1 - 79
Hypersonics Prototyping	0604033F	46	04.....	Volume 2 - 183
Hypersonics Prototyping - Hypersonic Attack Cruise Missile (HACM)	0604183F	47	04.....	Volume 2 - 191
ICBM Fuze Modernization	0604933F	95	05.....	Volume 2 - 757
ICBM Reentry Vehicles	0101328F	165	07.....	Volume 3 - 501
ISR Modernization & Automation Dvmt (IMAD)	0305022F	249	07.....	Volume 4 - 417
Information Systems Security Program	0303140F	237	07.....	Volume 4 - 317

**UNCLASSIFIED**



**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Initial Operational Test & Evaluation	0605712F	122	06.....	Volume 3 - 29
Integrated Broadcast Service (IBS)	0305179F	260	07.....	Volume 4 - 495
Integrated Primary Prevention	0808737F	79	04.....	Volume 2 - 559
Integrated Strategic Planning & Analysis Network	0101324F	164	07.....	Volume 3 - 493
Intel Data Applications	0208288F	219	07.....	Volume 4 - 225
Intelligence Advanced Development	0603260F	32	04.....	Volume 2 - 7
Intelligence Mission Data (IMD)	0307577F	272	07.....	Volume 4 - 635
Intercontinental Ballistic Missile - Dem/Val	0603851F	35	04.....	Volume 2 - 49
International Activities	1001004F	143	06.....	Volume 3 - 135
International Intelligence Technology and Architectures	0305600F	269	07.....	Volume 4 - 613
Isolated Personnel Survivability and Recovery	0207279F	104	05.....	Volume 2 - 845
Joint Air-to-Surface Standoff Missile (JASSM)	0207325F	190	07.....	Volume 3 - 781
Joint Counter RCIED Electronic Warfare	0205671F	173	07.....	Volume 3 - 593
Joint Cyber Command and Control (JCC2)	0208097F	214	07.....	Volume 4 - 209
Joint Military Deception Initiative	0303260F	239	07.....	Volume 4 - 355
Joint Personnel Recovery Agency	0901202F	285	07.....	Volume 4 - 769
Joint Simulation Environment (JSE)	0207606F	71	04.....	Volume 2 - 493
Joint Tactical Network (JTN)	0605031F	97	05.....	Volume 2 - 773
Joint Tactical Network Center (JTNC)	0605030F	96	05.....	Volume 2 - 765

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Joint Transportation Management System (JTMS)	0604668F	56	04.....	Volume 2 - 303
KC-135s	0401218F	278	07.....	Volume 4 - 695
KC-46A Tanker Squadrons	0401221F	113	05.....	Volume 2 - 913
Large Aircraft IR Countermeasures (LAIRCM)	0401134F	277	07.....	Volume 4 - 687
Life Support Systems	0604706F	92	05.....	Volume 2 - 725
Logistics Information Technology (LOGIT)	0708610F	282	07.....	Volume 4 - 735
Long Range Standoff Weapon	0604932F	94	05.....	Volume 2 - 745
Long Range Strike - Bomber	0604015F	43	04.....	Volume 2 - 151
MH-139A	0102110F	167	07.....	Volume 3 - 519
MQ-9 UAV	0205219F	172	07.....	Volume 3 - 571
Maintenance, Repair & Overhaul System	0708055F	281	07.....	Volume 4 - 725
Major T&E Investment	0604759F	119	06.....	Volume 3 - 11
Management HQ - R&D	0605898F	131	06.....	Volume 3 - 75
Management HQ - T&E	0606398F	135	06.....	Volume 3 - 101
Manned Destructive Suppression	0207136F	178	07.....	Volume 3 - 641
Manned Reconnaissance Systems	0305207F	263	07.....	Volume 4 - 555
Manufacturing Technology Program	0603680F	27	03.....	Volume 1 - 339
Materials	0602102F	5	02.....	Volume 1 - 41
Maui Space Surveillance System (MSSS)	0603444F	23	03.....	Volume 1 - 309

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Medical C-CBRNE Programs	0208036F	107	05.....	Volume 2 - 877
Minimum Essential Emergency Communications Network (MEECN)	0303131F	235	07.....	Volume 4 - 289
Minuteman Squadrons	0101213F	161	07.....	Volume 3 - 447
Mission Partner Environments	0305601F	74	04.....	Volume 2 - 523
Mission Planning Systems	0208006F	209	07.....	Volume 4 - 127
Modular Advanced Missile	0603036F	31	04.....	Volume 2 - 1
Multi-Platform Electronic Warfare Equipment	0207040F	174	07.....	Volume 3 - 599
NATO AGS	0305238F	267	07.....	Volume 4 - 595
NATO Research and Development	0603790F	34	04.....	Volume 2 - 43
NC3 Advanced Concepts	0604001F	36	04.....	Volume 2 - 73
NC3 Commercial Development & Prototyping	0604005F	39	04.....	Volume 2 - 109
NC3 Integration	0606018F	156	07.....	Volume 3 - 343
National Technical Nuclear Forensics	0207573F	203	07.....	Volume 4 - 69
Network-Centric Collaborative Targeting	0305221F	266	07.....	Volume 4 - 587
Next Generation Air Dominance	0207110F	64	04.....	Volume 2 - 427
Next Generation Air-refueling System	0605057F	60	04.....	Volume 2 - 409
Next Generation Air-refueling System	0605057F	99	05.....	Volume 2 - 793
Non-Kinetic Countermeasure Support	0302315F	232	07.....	Volume 4 - 271
North Warning System (NWS)	0102412F	169	07.....	Volume 3 - 541

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Nuclear Planning and Execution System (NPES)	0301112F	221	07.....	Volume 4 - 237
Nuclear Weapons Support	0604222F	84	05.....	Volume 2 - 609
OPERATIONAL HQ - CYBER	0208064F	211	07.....	Volume 4 - 153
Open Architecture Management	0605056F	98	05.....	Volume 2 - 781
Operational Energy and Installation Resilience	0604860F	59	04.....	Volume 2 - 387
Other Flight Training	0804743F	284	07.....	Volume 4 - 763
Over-the-Horizon Backscatter Radar	0102417F	170	07.....	Volume 3 - 547
PNT Resiliency, Mods, and Improvements	0604201F	48	04.....	Volume 2 - 201
PNT Resiliency, Mods, and Improvements	0604201F	83	05.....	Volume 2 - 599
Personnel Administration	0901220F	287	07.....	Volume 4 - 781
Personnel Recovery Command & Ctrl (PRC2)	0305984F	271	07.....	Volume 4 - 627
Physical Security Equipment	0604287F	87	05.....	Volume 2 - 663
Precision Attack Systems Procurement	0207249F	187	07.....	Volume 3 - 751
RAND Project Air Force	0605101F	120	06.....	Volume 3 - 17
RQ-4 UAV	0305220F	265	07.....	Volume 4 - 577
Rapid Cyber Acquisition	0305881F	270	07.....	Volume 4 - 621
Rapid Defense Experimentation Reserve (RDER)	0604025F	44	04.....	Volume 2 - 163
Rapid Sustainment Modernization (RSM)	0708051F	77	04.....	Volume 2 - 543
Region/Sector Operation Control Center Modernization Program	0102326F	168	07.....	Volume 3 - 535

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Requirements Analysis & Concept Maturation	0604609F	55	04.....	Volume 2 - 283
Requirements Analysis and Maturation	0606017F	134	06.....	Volume 3 - 91
Science & Technology for Nuclear Re-entry Systems	0603273F	22	03.....	Volume 1 - 301
Science and Technology Management - Major Headquarters Activities	0602298F	11	02.....	Volume 1 - 169
Security and Investigative Activities	0305128F	257	07.....	Volume 4 - 477
Seek Eagle	0207590F	204	07.....	Volume 4 - 75
Service Support to SPACECOM Activities	1202140F	291	07.....	Volume 4 - 817
Service Support to STRATCOM - Global Strike	0101318F	163	07.....	Volume 3 - 485
Small Business Innovation Research	0605502F	121	06.....	Volume 3 - 25
Small Diameter Bomb (SDB)	0207327F	191	07.....	Volume 3 - 791
Special Tactics / Combat Control	0408011F	280	07.....	Volume 4 - 715
Special Victim Accountability and Investigation	0808736F	78	04.....	Volume 2 - 551
Specialized Undergraduate Flight Training	0604233F	144	07.....	Volume 3 - 141
Stand In Attack Weapon	0207328F	105	05.....	Volume 2 - 853
Strategic Mission Planning & Execution System (SMPES)	0304100F	240	07.....	Volume 4 - 361
Submunitions	0604604F	90	05.....	Volume 2 - 701
Support to DCGS Enterprise	0305240F	268	07.....	Volume 4 - 601
Support to Information Operations (IO) Capabilities	0303166F	136	06.....	Volume 3 - 103
Survivable Airborne Operations Center (SAOC)	0604288F	50	04.....	Volume 2 - 223

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
Sustainment Science and Technology (S&T)	0603199F	17	03.....	Volume 1 - 239
Tactical AIM Missiles	0207161F	182	07.....	Volume 3 - 701
Tactical Air Control Party-Mod	0207444F	200	07.....	Volume 4 - 35
Tactical Data Networks Enterprise	0604281F	86	05.....	Volume 2 - 647
Tactical Data Networks Enterprise	0604281F	145	07.....	Volume 3 - 161
Tactical Deception	0208007F	210	07.....	Volume 4 - 145
Tactical Terminal	0305158F	259	07.....	Volume 4 - 489
Tech Transition Program	0604858F	58	04.....	Volume 2 - 349
Technology Transfer	0604317F	51	04.....	Volume 2 - 231
Test and Evaluation Support	0605807F	123	06.....	Volume 3 - 35
Theater Battle Management (TBM) C4I	0207438F	198	07.....	Volume 4 - 21
Theater Nuclear Weapon Storage & Security System	0305155F	111	05.....	Volume 2 - 901
Threat Simulator Development	0604256F	118	06.....	Volume 3 - 1
Three Dimensional Long-Range Radar (3DELRR)	0207455F	69	04.....	Volume 2 - 475
Training Developments	0804772F	116	05.....	Volume 2 - 955
U.S. Space Command Research and Development Support	1206415F	81	04.....	Volume 2 - 579
USAF Modeling and Simulation	0207601F	205	07.....	Volume 4 - 85
Unified Platform (UP)	0208099F	215	07.....	Volume 4 - 217
University Affiliated Research Center (UARC) - Tactical Autonomy	0602022F	4	02.....	Volume 1 - 37

**UNCLASSIFIED**

**UNCLASSIFIED**

Air Force • Budget Estimates FY 2025 • RDT&E Program

<b>Program Element Title</b>	<b>Program Element Number</b>	<b>Line #</b>	<b>BA</b>	<b>Page</b>
University Research Initiatives	0601103F	2	01.....	Volume 1 - 23
VC-25B	0401319F	114	05.....	Volume 2 - 933
Vehicles and Support Equipment - General	0202834F	171	07.....	Volume 3 - 563
War Reserve Materiel - Ammunition	0208030F	72	04.....	Volume 2 - 501
Wargaming and Simulation Centers	0207605F	206	07.....	Volume 4 - 99
Weather Service	0305111F	252	07.....	Volume 4 - 443
Wide Area Surveillance	0604445F	147	07.....	Volume 3 - 175
Worldwide Joint Strategic Communications	0101316F	162	07.....	Volume 3 - 475

**UNCLASSIFIED**

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED



Department of Defense  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

	FY 2023 Actuals	FY 2024 PB Request with CR Adjustments*	FY 2025 Request
<b><u>Summary Recap of Budget Activities</u></b>			
Basic Research	622,674	583,858	541,382
Applied Research	2,117,867	1,639,516	1,596,401
Advanced Technology Development	1,648,354	1,473,902	1,383,709
Advanced Component Development & Prototypes	10,991,064	14,088,176	16,037,150
System Development & Demonstration	11,193,856	12,489,748	11,823,371
Management Support	5,100,989	4,049,779	4,032,006
Operational Systems Development	30,143,717	31,317,391	32,237,640
Software And Digital Technology Pilot Programs	191,980	122,326	157,265
Undistributed		-4,234,749	
<b>Total Research, Development, Test, &amp; Evaluation</b>	<b>62,010,501</b>	<b>61,529,947</b>	<b>67,808,924</b>
<b><u>Summary Recap of FYDP Programs</u></b>			
Strategic Forces	1,307,587	2,047,638	2,203,291
General Purpose Forces	4,609,324	5,160,229	6,329,448
Intelligence and Communications	1,215,200	1,061,042	1,073,411
Mobility Forces	295,744	756,557	687,799
Research and Development	19,717,934	20,470,919	20,509,040
Central Supply and Maintenance	168,183	94,340	100,795
Training Medical and Other	22,590	39,491	47,126
Administration and Associated Activities	74,312	-4,141,592	121,005

\*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

UNCLASSIFIED

Department of the Air Force  
 FY 2025 President's Budget  
 Exhibit R-1 FY 2025 President's Budget  
 Total Obligational Authority  
 (Dollars in Thousands)

Mar 2024

	FY 2024 PB Request Overseas Operations Costs (OOC)*	FY 2025 Overseas Operations Costs (OOC)*
<b><u>Summary Recap of Budget Activities</u></b>		
System Development & Demonstration	1,792	1,831
Operational Systems Development	967	988
<b>Total Research, Development, Test, &amp; Evaluation</b>	<b>2,759</b>	<b>2,819</b>
<b><u>Summary Recap of FYDP Programs</u></b>		
General Purpose Forces	967	988
Research and Development	1,792	1,831
<b>Total Research, Development, Test, &amp; Evaluation</b>	<b>2,759</b>	<b>2,819</b>

\*FY 2024 and FY 2025 Overseas Operations Costs (OOC) numbers are a subset of the baseline submission.

\*FY 2023 includes \$0K in Overseas Operations Costs (OOC) Actuals. FY 2024 includes \$2,759K in OOC Requested. FY 2025 includes \$2,819K for the OOC Budget Estimate. OOC were financed previously with former Overseas Contingency Operations (OCO) funding.

Department of the Air Force
TOTAL CIVILIAN PERSONNEL COSTS
OP-8B: OP-8 (PB)
FY 2025 President's Budget Submission
(FY 2023)

Table with columns for personnel categories (Direct/Reimbursable Funded, US Direct Hire, etc.), strengths, FTEs, and costs. Includes subtotals for Direct Funded, Reimbursable Funded, and Total Personnel.

Department of the Air Force  
**TOTAL CIVILIAN PERSONNEL COSTS**  
 OP-8B: OP-8 (PB)  
 FY 2025 President's Budget Submission  
 (FY 2024)

	(S in Thousands)												d/c l Basic Comp	i/c m Total Comp	Rates k/c n Comp & Benefits	h/d o % BC Variables	j/d p % BC Benefits
	a Begin Strength	b End Strength	c FTEs	d Basic Comp	e Overtime Pay	f Holiday Pay	g Other O.C.11	e + f + g h Total Variables	d + h i Comp O.C.11	i Benefits O.C.12/13	i + j k Comp & Benefits						
<b>Direct Funded Personnel (includes OC 13)</b>	18,726	19,345	19,127	3,191,398	0	0	0	0	3,191,398	0	3,191,398	\$166,853	\$166,853	\$166,853	0.0%	0.0%	
<b>D1. US Direct Hire (USDH)</b>	18,724	19,343	19,125	3,190,276	-	-	-	-	3,190,276	-	3,190,276	\$166,812	\$166,812	\$166,812	0.0%	0.0%	
D1a. Senior Executive Schedule	13	75	75	11,567	-	-	-	-	11,567	-	11,567	\$154,227	\$154,227	\$154,227	0.0%	0.0%	
D1b. General Schedule	15,455	16,012	15,794	2,952,618	-	-	-	-	2,952,618	-	2,952,618	\$186,946	\$186,946	\$186,946	0.0%	0.0%	
D1c. Special Schedule	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
D1d. Wage System	3,256	3,256	3,256	226,091	-	-	-	-	226,091	-	226,091	\$69,438	\$69,438	\$69,438	0.0%	0.0%	
D1e. Highly Qualified Experts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
D1f. Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>D2. Direct Hire Program Foreign Nationals (DHFN)</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>D3. Total Direct Hire</b>	18,724	19,343	19,125	3,190,276	-	-	-	-	3,190,276	-	3,190,276	\$166,812	\$166,812	\$166,812	0.0%	0.0%	
<b>D4. Indirect Hire Foreign Nationals (IHFN)</b>	2	2	2	1,122	-	-	-	-	1,122	-	1,122	\$561,000	\$561,000	\$561,000	0.0%	0.0%	
Subtotal - Direct Funded (excludes OC 13)	18,726	19,345	19,127	3,191,398	-	-	-	-	3,191,398	-	3,191,398	\$166,853	\$166,853	\$166,853	0.0%	0.0%	
<b>D5. Other Object Class 13 Benefits</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
D5a. USDH - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
D5b. DHFN - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
D5c. Voluntary Separation Incentive Pay (VSIP)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
D5d. Foreign National Separation Liability Accrual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Reimbursable Funded Personnel (includes OC 13)</b>	4,591	4,591	4,591	608,639	0	0	0	0	608,639	0	608,639	\$132,572	\$132,572	\$132,572	0.0%	0.0%	
<b>R1. US Direct Hire (USDH)</b>	4,591	4,591	4,591	608,639	-	-	-	-	608,639	-	608,639	\$132,572	\$132,572	\$132,572	0.0%	0.0%	
R1a. Senior Executive Schedule	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R1b. General Schedule	4,591	4,591	4,591	608,639	-	-	-	-	608,639	-	608,639	\$132,572	\$132,572	\$132,572	0.0%	0.0%	
R1c. Special Schedule	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R1d. Wage System	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R1e. Highly Qualified Experts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R1f. Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>R2. Direct Hire Program Foreign Nationals (DHFN)</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>R3. Total Direct Hire</b>	4,591	4,591	4,591	608,639	-	-	-	-	608,639	-	608,639	\$132,572	\$132,572	\$132,572	0.0%	0.0%	
<b>R4. Indirect Hire Foreign Nationals (IHFN)</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Subtotal - Reimbursable Funded (excludes OC 13)	4,591	4,591	4,591	608,639	-	-	-	-	608,639	-	608,639	\$132,572	\$132,572	\$132,572	0.0%	0.0%	
<b>R5. Other Object Class 13 Benefits</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R5a. USDH - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R5b. DHFN - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R5c. Voluntary Separation Incentive Pay (VSIP)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R5d. Foreign National Separation Liability Accrual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Total Personnel (includes OC 13)</b>	23,317	23,936	23,718	3,800,037	0	0	0	0	3,800,037	0	3,800,037	\$160,217	\$160,217	\$160,217	0.0%	0.0%	
<b>T1. US Direct Hire (USDH)</b>	23,315	23,934	23,716	3,798,915	-	-	-	-	3,798,915	-	3,798,915	\$160,184	\$160,184	\$160,184	0.0%	0.0%	
T1a. Senior Executive Schedule	13	75	75	11,567	0	0	0	0	11,567	0	11,567	\$154,227	\$154,227	\$154,227	0.0%	0.0%	
T1b. General Schedule	20,046	20,603	20,385	3,561,257	0	0	0	0	3,561,257	0	3,561,257	\$174,700	\$174,700	\$174,700	0.0%	0.0%	
T1c. Special Schedule	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	
T1d. Wage System	3,256	3,256	3,256	226,091	0	0	0	0	226,091	0	226,091	\$69,438	\$69,438	\$69,438	0.0%	0.0%	
T1e. Highly Qualified Experts	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	
T1f. Other	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	
<b>T2. Direct Hire Program Foreign Nationals (DHFN)</b>	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-	
<b>T3. Total Direct Hire</b>	23,315	23,934	23,716	3,798,915	-	-	-	-	3,798,915	-	3,798,915	\$160,184	\$160,184	\$160,184	0.0%	0.0%	
<b>T4. Indirect Hire Foreign Nationals (IHFN)</b>	2	2	2	1,122	0	0	0	0	1,122	0	1,122	\$561,000	\$561,000	\$561,000	0.0%	0.0%	
Subtotal - Total Funded (excludes OC 13)	23,317	23,936	23,718	3,800,037	-	-	-	-	3,800,037	-	3,800,037	\$160,217	\$160,217	\$160,217	0.0%	0.0%	
<b>T5. Other Object Class 13 Benefits</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T5a. USDH - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	
T5b. DHFN - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	
T5c. Voluntary Separation Incentive Pay (VSIP)	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	
T5d. Foreign National Separation Liability Accrual	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	

Department of the Air Force  
 TOTAL CIVILIAN PERSONNEL COSTS  
 OP-8B: OP-8 (PB)  
 FY 2025 President's Budget Submission  
 (FY 2025)

	(S in Thousands)											d/c	i/c	Rates	h/d	j/d
	a	b	c	d	e	f	g	e + f + g	d + h	i	i + j	d/c	i/c	k/c	h/d	j/d
	Begin	End	FTEs	Basic	Overtime	Holiday	Other	h	i	Benefits	k	Basic	Total	n	% BC	% BC
	Strength	Strength		Comp	Pay	Pay	O.C.11	Total	Comp	O.C.12/13	Comp	Comp	Comp	& Benefits	Variables	Benefits
<b>Direct Funded Personnel (includes OC 13)</b>	19,345	19,949	19,949	2,226,320	0	0	0	0	2,226,320	876,094	3,102,414	\$111,601	\$111,601	\$155,517	0.0%	39.4%
<b>D1. US Direct Hire (USDH)</b>	19,343	19,947	19,947	2,225,988	-	-	-	-	2,225,988	876,094	3,102,082	\$111,595	\$111,595	\$155,516	0.0%	39.4%
D1a. Senior Executive Schedule	75	75	75	13,500	-	-	-	-	13,500	4,860	18,360	\$180,000	\$180,000	\$244,800	0.0%	36.0%
D1b. General Schedule	16,012	16,616	16,616	1,965,032	-	-	-	-	1,965,032	782,150	2,747,182	\$118,261	\$118,261	\$165,334	0.0%	39.8%
D1c. Special Schedule	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D1d. Wage System	3,256	3,256	3,256	247,456	-	-	-	-	247,456	89,084	336,540	\$76,000	\$76,000	\$103,360	0.0%	36.0%
D1e. Highly Qualified Experts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D1f. Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>D2. Direct Hire Program Foreign Nationals (DHFN)</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>D3. Total Direct Hire</b>	19,343	19,947	19,947	2,225,988	-	-	-	-	2,225,988	876,094	3,102,082	\$111,595	\$111,595	\$155,516	0.0%	39.4%
<b>D4. Indirect Hire Foreign Nationals (IHFN)</b>	2	2	2	332	-	-	-	-	332	-	332	\$166,000	\$166,000	\$166,000	0.0%	0.0%
Subtotal - Direct Funded (excludes OC 13)	19,345	19,949	19,949	2,226,320	-	-	-	-	2,226,320	876,094	3,102,414	\$111,601	\$111,601	\$155,517	0.0%	39.4%
<b>D5. Other Object Class 13 Benefits</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D5a. USDH - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D5b. DHFN - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D5c. Voluntary Separation Incentive Pay (VSIP)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D5d. Foreign National Separation Liability Accrual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Reimbursable Funded Personnel (includes OC 13)</b>	4,591	4,591	4,591	565,802	0	0	0	0	565,802	0	565,802	\$123,242	\$123,242	\$123,242	0.0%	0.0%
<b>R1. US Direct Hire (USDH)</b>	4,591	4,591	4,591	565,802	-	-	-	-	565,802	-	565,802	\$123,242	\$123,242	\$123,242	0.0%	0.0%
R1a. Senior Executive Schedule	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R1b. General Schedule	4,591	4,591	4,591	565,802	-	-	-	-	565,802	-	565,802	\$123,242	\$123,242	\$123,242	0.0%	0.0%
R1c. Special Schedule	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R1d. Wage System	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R1e. Highly Qualified Experts	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R1f. Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>R2. Direct Hire Program Foreign Nationals (DHFN)</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>R3. Total Direct Hire</b>	4,591	4,591	4,591	565,802	-	-	-	-	565,802	-	565,802	\$123,242	\$123,242	\$123,242	0.0%	0.0%
<b>R4. Indirect Hire Foreign Nationals (IHFN)</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal - Reimbursable Funded (excludes OC 13)	4,591	4,591	4,591	565,802	-	-	-	-	565,802	-	565,802	\$123,242	\$123,242	\$123,242	0.0%	0.0%
<b>R5. Other Object Class 13 Benefits</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R5a. USDH - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R5b. DHFN - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R5c. Voluntary Separation Incentive Pay (VSIP)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R5d. Foreign National Separation Liability Accrual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total Personnel (includes OC 13)</b>	23,936	24,540	24,540	2,792,122	0	0	0	0	2,792,122	876,094	3,668,216	\$113,778	\$113,778	\$149,479	0.0%	31.4%
<b>T1. US Direct Hire (USDH)</b>	23,934	24,538	24,538	2,791,790	-	-	-	-	2,791,790	876,094	3,667,884	\$113,774	\$113,774	\$149,478	0.0%	31.4%
T1a. Senior Executive Schedule	75	75	75	13,500	0	0	0	0	13,500	4,860	18,360	\$180,000	\$180,000	\$244,800	0.0%	36.0%
T1b. General Schedule	20,603	21,207	21,207	2,530,834	0	0	0	0	2,530,834	782,150	3,312,984	\$119,340	\$119,340	\$156,221	0.0%	30.9%
T1c. Special Schedule	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
T1d. Wage System	3,256	3,256	3,256	247,456	0	0	0	0	247,456	89,084	336,540	\$76,000	\$76,000	\$103,360	0.0%	36.0%
T1e. Highly Qualified Experts	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
T1f. Other	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
<b>T2. Direct Hire Program Foreign Nationals (DHFN)</b>	0	0	0	0	0	0	0	0	0	0	0	-	-	-	-	-
<b>T3. Total Direct Hire</b>	23,934	24,538	24,538	2,791,790	-	-	-	-	2,791,790	876,094	3,667,884	\$113,774	\$113,774	\$149,478	0.0%	31.4%
<b>T4. Indirect Hire Foreign Nationals (IHFN)</b>	2	2	2	332	0	0	0	0	332	0	332	\$166,000	\$166,000	\$166,000	0.0%	0.0%
Subtotal - Total Funded (excludes OC 13)	23,936	24,540	24,540	2,792,122	-	-	-	-	2,792,122	876,094	3,668,216	\$113,778	\$113,778	\$149,479	0.0%	31.4%
<b>T5. Other Object Class 13 Benefits</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5a. USDH - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5b. DHFN - Benefits for Former Employees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5c. Voluntary Separation Incentive Pay (VSIP)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T5d. Foreign National Separation Liability Accrual	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**UNCLASSIFIED**

**THIS PAGE INTENTIONALLY LEFT BLANK**

**UNCLASSIFIED**

# UNCLASSIFIED

## ACRONYMS

### *GENERAL ACRONYMS*

A&AS	- Advisory & Assistance Services
ABIDES	- Automated Budget Interactive Data Environment System
ACAT	- Acquisition Category
ACTD	- Advanced Concept Technology Demonstration
AGM	- Air-to-Ground Missile
AIM	- Air Intercept Missile
AIS	- Avionics Intermediate Shop
ACMI	- Aircraft Combat Maneuvering Instrumentation
AMRAAM	- Advanced Medium-Range Air-to-Air Missile
APPN	- Appropriation
ATD	- Advanced Technology Development
BA	- Budget Activity
BES	- Budget Estimate Submission
BY	- Budget Year
C3	- Command, Control, and Communication System
CFE	- Contractor Furnished Equipment
CONOPS	- Concept of Operation
CONUS	- Continental United States
CPMS	- Comprehensive Power Management System
CPT	- Cockpit Procedures Trainer
CRA	- Continuing Resolution Authority
CTS	- Countermeasures Test Set
CY	- Current Year
ECCM	- Electronic Counter Counter-Measures
ECM	- Electronic Counter Measures
ECO	- Engineering Change Orders
EOQ	- Economic Order Quantity
ECP	- Engineering Change Proposal
EPA	- Economic Price Adjustment
EW	- Electronic Warfare
EWAISP	- Electronic Warfare Avionics Integration Support Facility
FLIR	- Forward Looking Infra Red

UNCLASSIFIED

## UNCLASSIFIED

FOT&E	- Follow-on Test and Evaluation
FOC	- Fully Operational Capability
FLTS	- Flight Line Test Set
FPIF	- Fixed Price Incentive Firm
FPIS	- Fixed Price Incentive Fee, Successive Targets
FY	- Fiscal Year
GANS	- Global Access Navigation & Safety
GATM	- Global Air Traffic Management
GFE	- Government Furnished Equipment
GFP	- Government Furnished Property
GPS	- Global Positioning System
GSE	- Ground Support Equipment
ICS	- Interim Contractor Support
IOC	- Initial Operating Capability
IT	- Information Technology
JUON	- Joint Urgent Operational Need
MAIS	- Major Automated Information System Program
MDAP	- Major Defense Acquisition Program
METS	- Mobile Electronic Test Stations
MYP	- Multiyear Procurement
NAVWAR	- Navigation Warfare
NMC Rate	- Not Mission Capable Rate
OCO	- Overseas Contingency Operations
OOC	- Overseas Operations Costs
OT&E	- Operational Test and Evaluation
OWRM	- Other War Reserve Material
PAGEL	- Priced Aerospace Ground Equipment List
PB	- President's Budget
PBR	- Program Budget Review
PMA	- Program Management Administration
PMC	- Procurement Method Code
PNO	- Acquisition Program Number (MDAP Codes)
PR	- Purchase Request
PRCP	- Program Resource Collection Process
PTT	- Part Task Trainer
PY	- Prior Year

UNCLASSIFIED



## UNCLASSIFIED

R&M	- Reliability and Maintainability
RAA	- Rapid Acquisition Authority
RDT&E	- Research, Development, Test and Evaluation
RWR	- Radar Warning Receiver
ROM	- Rough Order of Magnitude
SS	- Sole Source
SOF	- Special Operation Force
TAF	- Tactical Air Force
TCAS	- Traffic Collision Alert and Avoidance System
TEWS	- Tactical Electronic Warfare System
TISS	- TEWS Intermediate Support System
TOA	- Total Obligation Authority
WCF	- Working Capital Fund
WRM	- War Reserve Material
WST	- Weapon System Trainer
UAV	- Unmanned Aerial Vehicle
XML	- Extensible Markup Language

### ***BASE / ORGANIZATIONAL ACRONYMS***

ACC	- Air Combat Command
AETC	- Air Education & Training Command
AFCAO	- Air Force Computer Acquisition Office
AFCEA	- Air Force Civil Engineering Support Agency
AFCIC	- AF Communications & Information Center
AFCSC	- Air Force Cryptologic Service Center
AFESC	- Air Force Engineering Services Center
AFGWC	- Air Force Global Weather Central
AFIT	- Air Force Institute of Technology
AFLCMC	- Air Force Life Cycle Management Center
AFMC	- Air Force Materiel Command
AFMETCAL	- Air Force Metrology and Calibration Office
AFMLO	- Air Force Medical Logistics Office
AFOSI	- Air Force Office of Special Investigation
AFOTEC	- Air Force Operational Test & Evaluation Center
AFPC	- Air Force Personnel Center

UNCLASSIFIED

## UNCLASSIFIED

AFPSL	- AF Primary Standards Lab
AFR	- Air Force Reserve
AFSOC	- AF Special Operations Command
AFSPC	- Air Force Space Command
AIA	- Air Intelligence Agency
ALC	- Air Logistics Center
AMC	- Air Mobility Command
ANG	- Air National Guard
ASC	- Aeronautical Systems Center
AETC	- Air Education Training Command
AU	- Air University
AWS	- Air Weather Service
CIA	- Central Intelligence Agency
DGSC	- Defense General Support Center
DLA	- Defense Logistics Center
DOE	- Department of Energy
DPSC	- Defense Personnel Support Center
DSCC	- Defense Supply Center, Columbus
DTIC	- Defense Technical Information Center
ER	- Eastern Range
ESC	- Electronic Systems Center
FAA	- Federal Aviation Agency
FBI	- Federal Bureau of Investigation
GSA	- General Services Administration
JCS	- Joint Chiefs of Staff
NATO	- North Atlantic Treaty Organization
OSD	- Office of the Secretary of Defense
PACAF	- Pacific Air Forces
USAF	- United States Air Force
USAFA	- United States Air Force Academy
USAFE	- United States Air Force Europe
USCENTCOM	- United States Central Command
USEUCOM	- United States European Command
USMC	- United States Marine Corps
USSTRATCOM	- United States Strategic Command
WP AFB	- Wright-Patterson AFB, OH

UNCLASSIFIED

## UNCLASSIFIED

### ***CONTRACT METHOD / TYPE ACRONYMS***

C	- Competitive
BA	- Basic Agreement
BOA	- Basic Ordering Agreement
BPA	- Blanket Purchasing Agreement
CS	- Cost Sharing
IDDQ	- Indefinite Delivery, Definite Quantity
IDIQ	- Indefinite Delivery, Indefinite Quantity
IDRT	- Indefinite Delivery, Requirements
Letter	- Letter
LH	- Labor-hour
MIPR	- Military Interdepartmental Purchase Request
MIPR-C	- Military Interdepartmental Purchase Request - Competitive
MIPR-OPT	- Military Interdepartmental Purchase Request - Option
MIPR-OTH	- Military Interdepartmental Purchase Request – Other
MIPR-SS	- Military Interdepartmental Purchase Request - Sole Source
OPT	- Option
OTH	- Other
PO	- Project Order
REQN	- Requisition
SS	- Sole Source
T&M	- Time and Materials
UCA	- Undefinitized Contract Action
WP	- Work Project

### ***CONTRACTED BY ACRONYMS***

11 WING	- 11th Support Wing, Washington, DC
ACC	- Air Combat Command, Langley AFB, VA
AEDC	- Arnold Engineering Development Center, Arnold AFB, TN
AAC	- Air Armament Center, Eglin AFB, FL
AEDC	- Arnold Engineering Development Center, Arnold AFB, TN
AETC	- Air Education and Training Command, Randolph AFB, TX
AFCIC	- Air Force Communications and Information Center, Washington, DC
AFCESA	- Air Force Civil Engineering Support Agency, Tyndall AFB, FL

UNCLASSIFIED

## UNCLASSIFIED

AFFTC	- Air Force Flight Test Center, Edwards AFB, CA
AFLCMC	- Air Force Life Cycle Management Center, Wright-Patterson AFB, OH
AFMC	- Air Force Materiel Command, Wright-Patterson AFB, OH
AFMETCAL	- Air Force Metrology and Calibration Office, Heath, Ohio
AFMLO	- Air Force Medical Logistics Office, Ft Detrick, MD
AIA	- Air Intelligence Agency, Kelly AFB, TX
AMC	- Air Mobility Command, Scott AFB, IL
ASC	- Aeronautical Systems Center, Wright-Patterson AFB, OH & Eglin AFB, FL
AFWA	- Air Force Weather Agency, Offutt AFB, NE
DGSC	- Defense General Support Center, Richmond, VA
DPSC	- Defense Personnel Support Center, Philadelphia, PA
ER	- Eastern Range, Patrick SFB, FL
ESC	- Electronic Systems Center, Hanscom AFB, MA
HSC	- Human Services Center, Brook AFB, TX
OC-ALC	- Oklahoma City Air Logistics Center, Tinker AFB, OK
OO-ALC	- Ogden Air Logistics Center, Hill AFB, UT
SMC	- Space & Missile Systems Center, Los Angeles AFB, CA
US STRATCOM	- US Strategic Command, Offutt AFB, NE
WACC	- Washington Area Contracting Center, Washington DC
WR	- Western Range, Vandenberg SFB, CA
WR-ALC	- Warner-Robins Air Logistics Center, Robins AFB, GA
AFSPC	- Air Force Space Command, Peterson AFB, CO
HQ ANG	- Headquarters, Air National Guard, Washington, DC
USAFE	- United States Air Force Europe, Ramstein AB, GE
USAFA	- United States Air Force Academy, Colorado Springs, CO

### ***IDENTIFICATION CODES***

Code "A"	- Line items of material which have been approved for Air Force service use.
Code "B"	- Line items of material that have not been approved for Service use
OBAN	- Operating Budget Account Number, 2-digit code for unit allocated funds

UNCLASSIFIED

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force / BA 1: Basic Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	0.000	377.616	401.486	361.930	0.000	361.930	308.870	333.612	382.456	405.800	Continuing	Continuing
613001: <i>Physics and Electronics</i>	0.000	110.951	117.740	102.282	0.000	102.282	89.962	95.019	109.404	115.176	Continuing	Continuing
613002: <i>Aerospace, Chemical and Material Sciences</i>	0.000	112.790	117.926	107.377	0.000	107.377	95.819	104.896	118.342	126.123	Continuing	Continuing
613003: <i>Mathematics, Information and Life Sciences</i>	0.000	117.022	118.511	110.237	0.000	110.237	97.943	102.723	116.654	122.155	Continuing	Continuing
613004: <i>Education and Outreach</i>	0.000	36.853	38.911	34.282	0.000	34.282	17.239	22.909	29.830	33.944	Continuing	Continuing
613005: <i>STEM Pipeline Development</i>	0.000	0.000	8.398	7.752	0.000	7.752	7.907	8.065	8.226	8.402	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

Defense Research Sciences consists of basic research activities in academia and industry along with research performed in the Department of the Air Force, including the Air Force Research Laboratory, Air Force Institute of Technology, and the United States Air Force Academy. This program supports basic broad-based scientific and engineering research in areas critical to Department of the Air Force weapon, sensor, and support systems. All research areas are subject to long-range planning and technical review by both Department of the Air Force and tri-Service scientific planning groups. Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

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 program element would be in addition to the civilian pay expenses budgeted in program elements 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602298F, 0602602F, 0602605F, 0602788F, and 1206601SF.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

Funds in this program element may be used to investigate specified science advancements in air, cyber, and/or multidomains.

This program is in Budget Activity 1, Basic Research because this budget activity includes scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force</i> / BA 1: <i>Basic Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>
--	--

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	406.125	401.486	382.183	0.000	382.183
Current President's Budget	377.616	401.486	361.930	0.000	361.930
Total Adjustments	-28.509	0.000	-20.253	0.000	-20.253
• 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	-3.090	0.000			
• SBIR/STTR Transfer	-10.406	0.000			
• Other Adjustments	-15.013	0.000	-20.253	0.000	-20.253

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 613001: *Physics and Electronics*

Congressional Add: *Program Increase - basic research*

Congressional Add Subtotals for Project: 613001

	<b>FY 2023</b>	<b>FY 2024</b>
	7.795	0.000
	7.795	0.000

**Project:** 613002: *Aerospace, Chemical and Material Sciences*

Congressional Add: *Program Increase - basic research*

Congressional Add Subtotals for Project: 613002

	7.795	0.000
	7.795	0.000

**Project:** 613003: *Mathematics, Information and Life Sciences*

Congressional Add: *Program Increase - basic research*

Congressional Add: *Program increase - Space Force human performance optimization research*

Congressional Add Subtotals for Project: 613003

	7.795	0.000
	5.651	0.000
	13.446	0.000

**Project:** 613004: *Education and Outreach*

Congressional Add: *Program increase: basic research*

Congressional Add Subtotals for Project: 613004

Congressional Add Totals for all Projects

	0.974	0.000
	0.974	0.000
	30.010	0.000

UNCLASSIFIED

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force</i> / BA 1: <i>Basic Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	
<b><u>Change Summary Explanation</u></b> Decrease in FY 2025 is due to Space-focused basic research transferring to 3620F: Research, Development, Test & Evaluation, Space Force; Program Element 0601102SF, Defense Research Sciences; Project 610001: Defense Research Sciences - Space.		

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 1					<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>				<b>Project (Number/Name)</b> 613001 / <i>Physics and Electronics</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
613001: <i>Physics and Electronics</i>	0.000	110.951	117.740	102.282	0.000	102.282	89.962	95.019	109.404	115.176	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

Basic research in the Physics and Electronics Project seeks to enable revolutionary advances and expand the fundamental knowledge supporting technologies critical to the future of the Department of the Air Force. Research prioritizes high-risk, high-reward, game-changing scientific breakthroughs essential for future leaps in warfighter system performance, functionality, reliability, and survivability while simultaneously reducing component and system power, size, mass, and life cycle costs. Major areas being investigated in this project are complex electronics and fundamental quantum processes; plasma physics and high energy density non-equilibrium processes; and lasers and optics, electromagnetics, communication, and signal processing. While the following specific efforts are the focus of the project, there is interest in exploring novel ideas that may bridge these major efforts as well as those in the other projects within this program.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
<b>Title:</b> Complex Electronics and Fundamental Quantum Processes	41.262	47.096	49.454	0.000	49.454
<b>Description:</b> Scientific focus areas are atomic and molecular physics, photonics, quantum electronic solids, gigahertz-terahertz electronics and materials, semiconductor and electromagnetic materials, and optoelectronics.					
<b>FY 2024 Plans:</b> Explore a wide range of complex materials and devices, including non-linear optical materials, photonics, optoelectronics, metamaterials, cathodes, dielectric and magnetic materials, memristive systems, new classes of high-temperature superconductors, quantum dots, quantum wells and graphene. Includes generating and controlling quantum states, such as superposition and entanglement, in photonic systems, quantum dots and defects in solids, and ultracold atoms and molecules.					
<b>FY 2025 Base Plans:</b> - Continue exploring a wide range of complex materials and devices, including non-linear optical materials, photonics, optoelectronics, metamaterials, cathodes, dielectric and magnetic materials, memristive systems, new classes of high-temperature superconductors, quantum dots, quantum wells and graphene. - Continue exploration related to generating and controlling quantum states, such as superposition and entanglement, in photonic systems, quantum dots and defects in solids, and ultracold atoms and molecules.					
<b>FY 2025 OCO Plans:</b> Not Applicable					
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>					



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613001 / <i>Physics and Electronics</i>
--	--	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
---	---------	---------	--------------	-------------	---------------

FY 2025 increased compared to FY 2024 by \$2.358 million. Funding increased due to added emphasis in this effort.					
---	--	--	--	--	--

<p><b>Title:</b> Plasma Physics and High Energy Density Non-Equilibrium Processes</p> <p><b>Description:</b> Scientific focus areas are plasma and electro-energetic physics.</p> <p><b>FY 2024 Plans:</b> Explore a wide range of activities characterized by processes sufficiently energetic to require understanding and managing plasma phenomenology and the non-linear response of materials to high electric and magnetic fields. Includes space weather, plasma discharges, radio frequency propagation, radio frequency-plasma interaction, and high-power, beam-driven microwave devices.</p> <p><b>FY 2025 Base Plans:</b> - Continue exploring a wide range of activities characterized by processes sufficiently energetic to require understanding and managing plasma phenomenology and the non-linear response of materials to high electric and magnetic fields. - Continue exploring plasma discharges, radio frequency propagation, radio frequency-plasma interaction, and high-power, beam-driven microwave devices. - Note: In FY 2025 and beyond space science research will be accomplished in 3620F: Research, Development, Test &amp; Evaluation, Space Force; Program Element 0601102SF, Defense Research Sciences; Project 610001: Defense Research Sciences - Space.</p> <p><b>FY 2025 OCO Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$8.977 million due to movement of effort to USSF program as shown in FY 2025 plans.</p>	21.663	24.725	15.748	0.000	15.748
--	--------	--------	--------	-------	--------

<p><b>Title:</b> Lasers and Optics, Electromagnetics, Communication and Signal Processing</p> <p><b>Description:</b> Scientific focus areas are physical mathematics and applied analysis, novel computational methods, electromagnetics and wave propagation in complex media, ultra-fast dynamics, for revolutionary approaches to remote sensing and imaging physics, and surveillance and navigation.</p> <p><b>FY 2024 Plans:</b></p>	40.231	45.919	37.080	0.000	37.080
--	--------	--------	--------	-------	--------

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613001 / <i>Physics and Electronics</i>
--	--	---

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
<p>Explore all aspects of producing and receiving electromagnetic and electro-optical signals, as well as their propagation through complex media, including adaptive optics and optical imaging. Investigate aspects of the phenomenology of lasers including high energy lasers, non-linear optics, and ultra-short pulse laser science. Includes the development of sophisticated mathematics and algorithm development for extracting information from complex and/or sparse signals as well as calculating astrodynamical spacecraft orbits.</p> <p><b><i>FY 2025 Base Plans:</i></b></p> <ul style="list-style-type: none"> <li>- Continue exploring all aspects of producing and receiving electromagnetic and electro-optical signals, as well as their propagation through complex media, including adaptive optics and optical imaging.</li> <li>- Continue to investigate aspects of the phenomenology of lasers including high energy lasers, non-linear optics, and ultra-short pulse laser science.</li> <li>- Continue sophisticated mathematics and algorithm development for extracting information from complex and/or sparse signals.</li> </ul> <p>- Note: In FY 2025 and beyond astrodynamics research will be accomplished in 3620F: Research, Development, Test &amp; Evaluation, Space Force; Program Element 0601102SF, Defense Research Sciences; Project 610001: Defense Research Sciences - Space.</p> <p><b><i>FY 2025 OCO Plans:</i></b> Not Applicable</p> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$8.839 million due to movement of effort to USSF program as shown in FY 2025 plans.</p>					
<b>Accomplishments/Planned Programs Subtotals</b>	103.156	117.740	102.282	0.000	102.282

	FY 2023	FY 2024
<b><i>Congressional Add:</i></b> Program Increase - basic research	7.795	0.000
<b><i>FY 2023 Accomplishments:</i></b> Conducted Congressionally directed effort.		
<b><i>FY 2024 Plans:</i></b> Not Applicable		
<b>Congressional Adds Subtotals</b>	7.795	0.000

**C. Other Program Funding Summary (\$ in Millions)**

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force Date: March 2024

<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613001 / <i>Physics and Electronics</i>
--	--	---

**C. Other Program Funding Summary (\$ in Millions)**

**Remarks**

**D. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 1					<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>				<b>Project (Number/Name)</b> 613002 / <i>Aerospace, Chemical and Material Sciences</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
613002: <i>Aerospace, Chemical and Material Sciences</i>	0.000	112.790	117.926	107.377	0.000	107.377	95.819	104.896	118.342	126.123	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

Basic research in the Aerospace, Chemical, and Materials Sciences Project seeks to enable revolutionary advances and expand the fundamental knowledge supporting technologies critical to the future of the Department of the Air Force. Research stresses high-risk, high-reward, game-changing scientific breakthroughs essential for future leaps in warfighter system performance, functionality, reliability, and survivability while simultaneously reducing component and system power, size, mass, and life cycle costs. Research topics include: aero-structure interactions and control; energy, power, and propulsion; complex materials and structures; and cross-disciplinary research reflecting the highly integrated nature of future weapon systems. While the following specific efforts are the focus of the project there is interest in exploring novel ideas that may bridge these major efforts as well as those in other projects within this program.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
<b>Title:</b> Aero-Structure Interactions and Control	31.499	35.378	36.236	0.000	36.236
<b>Description:</b> Scientific focus areas are high temperature aerospace materials, non-equilibrium aerothermodynamics and chemistry, unsteady, compressible flow turbulence, multiscale fluid-material interactions, and flow control.					
<b>FY 2024 Plans:</b> Investigate the characterization, modeling, and exploitation of interactions between the unsteady aerodynamic flow field and the dynamic air vehicle structure to enable enhanced performance in next-generation Department of the Air Force systems. Explore the synergy gained from an interdisciplinary look at multiple technologies and the integration of core disciplines of fluid mechanics, high-performance structures, and thermodynamics.					
<b>FY 2025 Base Plans:</b> - Continue investigating the characterization, modeling, and exploitation of interactions between the unsteady aerodynamic flow field and the dynamic air vehicle structure to enable enhanced performance in next-generation Department of the Air Force systems. - Continue to explore the synergy gained from an interdisciplinary look at multiple technologies and the integration of core disciplines of fluid mechanics, high-performance structures, and thermodynamics.					
<b>FY 2025 OCO Plans:</b>					

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613002 / <i>Aerospace, Chemical and Material Sciences</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Not Applicable					
<p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 increased compared to FY 2024 by \$0.858 million. Justification for this increase is described in the plans above.</p>					
<p><b><i>Title:</i></b> Energy, Power, and Propulsion</p> <p><b><i>Description:</i></b> Scientific focus areas are thermal control, theoretical chemistry, molecular dynamics, power and propulsion, and combustion and diagnostics.</p> <p><b><i>FY 2024 Plans:</i></b> Develop potentially revolutionary scientific advances by integrating core disciplines of combustion, plasma dynamics, chemistry, hydrodynamics, structural dynamics, and multi-fidelity simulations. Investigate processes associated with the generation, storage, and utilization of energy, specifically for Department of the Air Force systems including developing novel energetic materials as well as understanding optimizing and controlling combustion processes.</p> <p><b><i>FY 2025 Base Plans:</i></b> - Continue developing potentially revolutionary scientific advances by integrating core disciplines of combustion, plasma dynamics, chemistry, hydrodynamics, structural dynamics, and multi-fidelity simulations. - Continue to investigate processes associated with the generation, storage, and utilization of energy, specifically for Department of the Air Force systems including developing novel energetic materials as well as understanding optimizing and controlling combustion processes.</p> <p><b><i>FY 2025 OCO Plans:</i></b> Not Applicable</p> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$5.294 million. Funding decreased due to decreased emphasis in this effort.</p>	32.548	36.557	31.263	0.000	31.263
<p><b><i>Title:</i></b> Complex Materials and Structures</p> <p><b><i>Description:</i></b> Scientific focus areas are design, manufacturing, and dynamics and control of multifunctional materials and microsystems, multi-scale mechanics, diagnostics and prognosis, and physio-chemistry of novel organic materials.</p>	40.948	45.991	39.878	0.000	39.878

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613002 / <i>Aerospace, Chemical and Material Sciences</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
<p><b><i>FY 2024 Plans:</i></b> Investigate multifunctional materials and structures composed of different classes of materials, both organic and inorganic, that can adapt to environmental constraints or mission requirements. Explore complex materials, microsystems, and structures that incorporate hierarchical design and functionality from the nanoscale through the mesoscale, ultimately leading to controlled, well-understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility.</p> <p><b><i>FY 2025 Base Plans:</i></b> - Continue investigating multifunctional materials and structures composed of different classes of materials, both organic and inorganic, that can adapt to environmental constraints or mission requirements. - Continue to explore complex materials, microsystems, and structures that incorporate hierarchical design and functionality from the nanoscale through the mesoscale, ultimately leading to controlled, well-understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility.</p> <p><b><i>FY 2025 OCO Plans:</i></b> Not Applicable</p> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$6.113 million. Funding decreased due to merging two portfolios into a single structures-focused research portfolio.</p>					
<b>Accomplishments/Planned Programs Subtotals</b>	104.995	117.926	107.377	0.000	107.377
	<b>FY 2023</b>	<b>FY 2024</b>			
<b><i>Congressional Add:</i></b> Program Increase - basic research	7.795	0.000			
<b><i>FY 2023 Accomplishments:</i></b> Conducted Congressionally directed effort.					
<b><i>FY 2024 Plans:</i></b> Not Applicable					
<b>Congressional Adds Subtotals</b>	7.795	0.000			

<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A
<b>Remarks</b>

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613002 / <i>Aerospace, Chemical and Material Sciences</i>

**D. Acquisition Strategy**  
Not Applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 1					<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>				<b>Project (Number/Name)</b> 613003 / <i>Mathematics, Information and Life Sciences</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
613003: <i>Mathematics, Information and Life Sciences</i>	0.000	117.022	118.511	110.237	0.000	110.237	97.943	102.723	116.654	122.155	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

Basic research in the Mathematics, Information Sciences, and Life Sciences Project seeks to expand fundamental knowledge and enable revolutionary advances and supporting technologies critical to the future of the Department of the Air Force. Major areas being investigated in this project are data fusion, machine learning and artificial intelligence, information and complex networks, cyber-security, autonomous decision making, dynamical systems, optimization and control, and natural materials and systems. While the following are specific sub-areas within this project, there is a continuing interest to explore novel ideas to bridge disciplines within this program.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
<b>Title:</b> Information and Complex Networks	25.894	29.628	24.047	0.000	24.047
<p><b>Description:</b> Scientific focus areas are information operations and security, data and information fusion, advanced computing, artificial intelligence and complex networks.</p> <p><b>FY 2024 Plans:</b> Design and analyze techniques to enable reliable and secure exchange of information and predictable operation of networks and systems, including hardware and software interactions. Investigate traditional aspects of information assurance with an emphasis on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing. Analyze, optimize, and design multi-scale networks with resilient features against noise and corruption from difficult environments and adversarial operations, using rigorous mathematical models of information exchange, physical operations, and human-machine interactions. Develop new computing approaches and algorithms for network-of-network information processing at the speed of warfare and new mathematical approaches for predictive, multi-scale and multi-physics simulations of Department of the Air Force systems and systems-of-systems in realistic environments.</p> <p><b>FY 2025 Base Plans:</b> - Continue designing and analyzing techniques to enable reliable and secure exchange of information and predictable operation of networks and systems, including hardware and software interactions. - Continue to investigate traditional aspects of information assurance with an emphasis on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing.</p>					



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613003 / <i>Mathematics, Information and Life Sciences</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
<p>- Continue to analyze, optimize, and design multi-scale networks with resilient features against noise and corruption from difficult environments and adversarial operations, using rigorous mathematical models of information exchange, physical operations, and human-machine interactions.</p> <p>- Continue to develop new computing approaches and algorithms for network-of-network information processing at the speed of warfare and new mathematical approaches for predictive, multi-scale and multi-physics simulations of Department of the Air Force systems and systems-of-systems in realistic environments.</p> <p><b>FY 2025 OCO Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$5.581 million. Funding decreased due to decreased emphasis in this effort.</p>					
<p><b>Title:</b> Decision Making</p> <p><b>Description:</b> Scientific focus areas are mathematical modeling of cognition and decision making, development and testing of advanced representations and processes for higher-level artificial intelligence, trust between humans and autonomous agents, mixed human-machine decision making, and computational social science for asymmetric threat detection and predictive largescale influence.</p> <p><b>FY 2024 Plans:</b> Investigate new mathematical laws, scientific principles, and robust algorithms that underlie intelligent, mixed human-machine decision-making to achieve accurate real-time integration of human expertise and knowledge into a machine-based battlespace network. Develop new mathematical models for information capture; object, scene and relation identification; and multi-level reasoning and meta-learning. Advance the critical knowledge base in modeling of individual and group cognitive processing and decision making, and construct advanced methodologies for predictive, verifiable simulations of large-scale socio-cultural and human-machine hybrid networks.</p> <p><b>FY 2025 Base Plans:</b> - Continue investigating new mathematical laws, scientific principles, and robust algorithms that underlie intelligent, mixed human-machine decision-making to achieve accurate real-time integration of human expertise and knowledge into a machine-based battlespace network. - Continue to develop new mathematical models for information capture; object, scene and relation identification; and multi-level reasoning and meta-learning.</p>	20.715	23.702	24.150	0.000	24.150

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613003 / <i>Mathematics, Information and Life Sciences</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
<p>- Continue to advance the critical knowledge base in modeling of individual and group cognitive processing and decision making, and construct advanced methodologies for predictive, verifiable simulations of large-scale socio-cultural and human-machine hybrid networks.</p> <p><b>FY 2025 OCO Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$0.448 million. Justification for this increase is described in the plans above.</p>					
<p><b>Title:</b> Dynamical Systems, Optimization, and Control</p> <p><b>Description:</b> Scientific focus areas are computer models of dynamical data and communication networks, data-fusion, dynamics and control theory for multi-scale and complex networks, and mathematics of distributed optimization in uncertain, variable, continuous and discrete networked systems. Includes the development of advanced computing architectures for solving optimization and data-fusion problems in real time and by embedded processors in autonomous or semi-autonomous platforms.</p> <p><b>FY 2024 Plans:</b> Develop new scientific concepts supported by rigorous analysis for advancing the science of autonomy and promoting the understanding necessary to analyze and design complex multi-scale systems as well as to provide guaranteed levels of performance. Develop novel adaptive control strategies for coordinating heterogeneous, autonomous, or semiautonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments.</p> <p><b>FY 2025 Base Plans:</b> - Continue developing new scientific concepts supported by rigorous analysis for advancing the science of autonomy and promoting the understanding necessary to analyze and design complex multi-scale systems as well as to provide guaranteed levels of performance. - Continue to develop novel adaptive control strategies for coordinating heterogeneous, autonomous, or semiautonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments.</p> <p><b>FY 2025 OCO Plans:</b></p>	26.930	30.813	31.323	0.000	31.323

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613003 / <i>Mathematics, Information and Life Sciences</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Not Applicable					
<p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 increased compared to FY 2024 by \$0.510 million. Justification for this increase is described in the plans above.</p>					
<p><b><i>Title:</i></b> Natural Materials and Systems</p> <p><b><i>Description:</i></b> Scientific focus areas are natural materials and nature inspired systems, human performance and biosystems, cognitive neuroscience and biophysics.</p> <p><b><i>FY 2024 Plans:</i></b> Investigate multidisciplinary approaches for studying, using, mimicking, synthesizing, and adapting to the ways natural systems are built, assembled and organized, and functioning to accomplish their objectives. Develop a fundamental understanding of bio-chemical mechanisms and control procedures for the production and manufacture of natural materials and develop reverse-engineering approaches to optimize the bio-chemical functionality. Develop approaches to adapt, blend, and mimic existing natural sensory systems and neural systems of varying complexity, to add existing capabilities to these organisms and design in-silico replicas with similar or advanced capabilities.</p> <p><b><i>FY 2025 Base Plans:</i></b> - Continue investigating multidisciplinary approaches for studying, using, mimicking, synthesizing, and adapting to the ways natural systems are built, assembled and organized, and functioning to accomplish their objectives. - Continue to develop a fundamental understanding of bio-chemical mechanisms and control procedures for the production and manufacture of natural materials and develop reverse-engineering approaches to optimize the bio-chemical functionality. - Continue to develop approaches to adapt, blend, and mimic existing natural sensory systems and neural systems of varying complexity, to add existing capabilities to these organisms and design in-silico replicas with similar or advanced capabilities.</p> <p><b><i>FY 2025 OCO Plans:</i></b> Not Applicable</p> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b></p>	30.037	34.368	30.717	0.000	30.717

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613003 / <i>Mathematics, Information and Life Sciences</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
FY 2025 decreased compared to FY 2024 by \$3.651 million. Funding decreased due to decreased emphasis in this effort.					
<b>Accomplishments/Planned Programs Subtotals</b>	103.576	118.511	110.237	0.000	110.237
	<b>FY 2023</b>	<b>FY 2024</b>			
<b>Congressional Add:</b> Program Increase - basic research	7.795	0.000			
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed effort.					
<b>FY 2024 Plans:</b> Not Applicable					
<b>Congressional Add:</b> Program increase - Space Force human performance optimization research	5.651	0.000			
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed effort.					
<b>FY 2024 Plans:</b> Not Applicable					
<b>Congressional Adds Subtotals</b>	13.446	0.000			

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 1					<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>				<b>Project (Number/Name)</b> 613004 / <i>Education and Outreach</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
613004: <i>Education and Outreach</i>	0.000	36.853	38.911	34.282	0.000	34.282	17.239	22.909	29.830	33.944	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The major efforts in the Science and Technology (S&T) Education and Outreach Project are to facilitate interactions between the international and domestic research communities and Department of the Air Force researchers, and to develop scientists and engineers with an awareness of Department of the Air Force basic research priorities. These professional interactions and collaborations benefit the Department of the Air Force by increasing awareness of basic research priorities in the research community as a whole and attracting talented scientists and engineers to address Department of the Air Force needs. International interactions foster relationships with scientific partners and leverage international expertise in nascent scientific developments. This project also seeks to enhance interactions with Historically Black Colleges and Universities, Hispanic-Serving Institutions, and other minority institutions.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
<b>Title:</b> Outreach to International S&T Community	12.558	14.008	17.055	0.000	17.055
<b>Description:</b> Foster international basic research discovery by supporting direct interchanges with a broad range of key international researchers and communities. Identify and leverage international scientific advances when appropriate.					
<b>FY 2024 Plans:</b> Leverage international expertise to identify and maintain awareness of foreign scientific developments. Explore foreign investments and influence world-class scientific research on specific topics of interest to the Department of the Air Force. Pursue access to fundamental scientific discoveries outside the U.S. relevant to the Department of the Air Force. Support international visits by scientists and high-level DoD fundamental science delegations, providing primary interface to coordinate international science and technology participation among DoD organizations.					
<b>FY 2025 Base Plans:</b> - Continue leveraging international expertise to identify and maintain awareness of foreign scientific developments. - Continue to explore foreign investments and influence world-class scientific research on specific topics of interest to the Department of the Air Force. - Continue to pursue access to fundamental scientific discoveries outside the U.S. relevant to the Department of the Air Force.					

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613004 / <i>Education and Outreach</i>
--	--	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
<p>- Continue to support international visits by scientists and high-level DoD fundamental science delegations, providing primary interface to coordinate international science and technology participation among DoD organizations.</p> <p><b>FY 2025 OCO Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$3.047 million. Funding increased due to added emphasis in international research.</p>					
<p><b>Title:</b> Outreach to U.S. S&amp;T Workforce</p> <p><b>Description:</b> Strengthen science, mathematics, and engineering research and infrastructure in the U.S., thereby strengthening current and future Department of the Air Force S&amp;T capabilities.</p> <p><b>FY 2024 Plans:</b> Identify, recruit, and increase opportunities for new investigators to participate in critical Department of the Air Force research. Support basic science, mathematics, and engineering research efforts with Historically Black Colleges and Universities (HBCU), Hispanic-Serving Institutions, and other minority institutions. Focus investment and outreach to HBCUs to include funding in microelectronics, materials, energy, aerospace, and chemistry and other fields of importance to the Department of the Air Force.</p> <p><b>FY 2025 Base Plans:</b> - Continue identifying, recruiting, and increasing opportunities for new investigators to participate in critical Department of the Air Force research. - Continue to support basic science, mathematics, and engineering research efforts with Historically Black Colleges and Universities (HBCU), Hispanic-Serving Institutions, and other minority institutions. - Continue to focus investment and outreach to HBCUs to include funding in microelectronics, materials, energy, aerospace, and chemistry and other fields of importance to the Department of the Air Force. - Note: In FY 2025 and beyond some work in this effort will be accomplished in 3620F: Research, Development, Test &amp; Evaluation, Space Force; Program Element 0601102SF, Defense Research Sciences; Project 610001: Defense Research Sciences - Space.</p> <p><b>FY 2025 OCO Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	23.321	24.903	17.227	0.000	17.227

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613004 / <i>Education and Outreach</i>
--	--	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
FY 2025 decreased compared to FY 2024 by \$7.676 million due to movement of effort to USSF program as shown in FY 2025 plans and decreased emphasis in this effort.					
<b>Accomplishments/Planned Programs Subtotals</b>	35.879	38.911	34.282	0.000	34.282

	FY 2023	FY 2024
<b>Congressional Add:</b> Program increase: basic research	0.974	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed effort.		
<b>FY 2024 Plans:</b> Not Applicable		
<b>Congressional Adds Subtotals</b>	0.974	0.000

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 1					<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>				<b>Project (Number/Name)</b> 613005 / <i>STEM Pipeline Development</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
613005: <i>STEM Pipeline Development</i>	0.000	0.000	8.398	7.752	0.000	7.752	7.907	8.065	8.226	8.402	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The major efforts in the Science, Technology, Engineering, and Mathematics (STEM) Pipeline Development Project are initiatives to support STEM education and outreach activities for kindergarten through 12th grade (K-12) students, and to support activities that encourage elementary, middle, and high-school youths to develop an interest in, and pursue, higher education and employment in the science, mathematics, and engineering career fields. These initiatives benefit the Department of the Air Force by cultivating a progressive pipeline of highly-trained and knowledgeable scientists and engineers aimed at filling Department of the Air Force science and engineering (S&E) workforce needs. This project seeks to cultivate STEM opportunities across the Department of the Air Force by supporting education and outreach activities that promote foundational knowledge building and experiential learning to inspire young students to pursue STEM-related career fields of critical importance to the Department of the Air Force.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
<b>Title:</b> K-12 STEM Outreach	0.000	6.373	5.687	0.000	5.687
<b>Description:</b> Foster Science, Technology, Engineering, and Mathematics (STEM) education and outreach activities for kindergarten through 12th grade (K-12) students and their educators to encourage an interest in STEM, provide exposure to STEM careers and opportunities, and to inspire the pursuit of higher education and employment in the Department of the Air Force science, mathematics, and engineering fields.					
<b>FY 2024 Plans:</b> Develop, institutionalize, and coordinate K-12 STEM outreach activities throughout the Department of the Air Force. Leverage ongoing partnerships with industry, schools, and other government agencies, in order to enhance the effectiveness of investments in outreach that promotes foundational knowledge building, experiential learning, and STEM workforce development.					
<b>FY 2025 Base Plans:</b> - Continue developing, institutionalizing, and coordinating K-12 STEM outreach activities throughout the Department of the Air Force. - Continue leveraging ongoing partnerships with industry, schools, and other government agencies, in order to enhance the effectiveness of investments in outreach that promotes foundational knowledge building, experiential learning, and STEM workforce development.					
<b>FY 2025 OCO Plans:</b>					



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613005 / <i>STEM Pipeline Development</i>
--	--	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Not Applicable					
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$0.686 million. Funding decreased due to alignment with approved funding profile.					
<b><i>Title:</i></b> Leadership Experience Growing Apprenticeships Committed to Youth (LEGACY) <b><i>Description:</i></b> Attract, inspire and develop the next generation of our nation's scientific and technical workforce, thereby strengthening future Department of the Air Force S&T capabilities. <b><i>FY 2024 Plans:</i></b> Identify, cultivate, and increase Science, Technology, Engineering, and Mathematics (STEM) opportunities across the Department of the Air Force through a progressive pipeline aimed at filling future science and engineering (S&E) workforce needs. Support STEM activities that identify and retain talented elementary, middle school, high-school, and undergraduate students to develop a young, diverse talent pool that will form the future S&E workforce. <b><i>FY 2025 Base Plans:</i></b> - Continue identifying, cultivating, and increasing Science, Technology, Engineering, and Mathematics (STEM) opportunities across the Department of the Air Force through a progressive pipeline aimed at filling future science and engineering (S&E) workforce needs. - Continue supporting STEM activities that identify and retain talented elementary, middle school, high-school, and undergraduate students to develop a young, diverse talent pool that will form the future S&E workforce. <b><i>FY 2025 OCO Plans:</i></b> Not Applicable <b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 increased compared to FY 2024 by \$0.040 million. Justification for this increase is described in the plans above.	0.000	2.025	2.065	0.000	2.065
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	8.398	7.752	0.000	7.752

**C. Other Program Funding Summary (\$ in Millions)**  
N/A

**Remarks**

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 1	<b>R-1 Program Element (Number/Name)</b> PE 0601102F / <i>Defense Research Sciences</i>	<b>Project (Number/Name)</b> 613005 / <i>STEM Pipeline Development</i>

**D. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force / BA 1: Basic Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0601103F / <i>University Research Initiatives</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	191.797	182.372	143.372	0.000	143.372	98.091	107.526	119.875	138.624	Continuing	Continuing
615094: <i>University Research Initiatives</i>	-	191.797	182.372	143.372	0.000	143.372	98.091	107.526	119.875	138.624	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program supports defense-related basic research in a wide range of scientific and engineering disciplines relevant to maintaining U.S. military technological superiority. Research topics include, but are not limited to, transformational and high-priority technologies such as nanotechnology, sensor networks, artificial intelligence and information fusion, smart materials and structures, quantum materials and processes for sensing, communication and computing, efficient energy and power conversion, and high-energy materials for propulsion and control. The program also enhances and promotes the education of U.S. scientists and engineers in disciplines critical to maintaining, advancing, and enabling future U.S. defense technologies. For example, the National Defense Science and Engineering Graduate (NDSEG) program awards fellowships to train U.S. citizens in science and engineering disciplines of military importance under a joint tri-Service and Office of the Under Secretary of Defense for Research and Engineering competitive scholarship program. Finally, this program assists universities in establishing superior instrumentation capabilities needed to improve the quality of defense-related research and education. A fundamental component of this program is the recognition that future technologies and technology exploitations require highly coordinated and concerted multi- and interdisciplinary efforts. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

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 the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602298F, 0602602F, 0602605F, 0602788F, and 1206601SF.

Funds in this program element may be used to investigate specified science advancements in air, cyber, and/or multidomains.

This program is in Budget Activity 1, Basic Research because this budget activity includes scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 1: Basic Research	<b>R-1 Program Element (Number/Name)</b> PE 0601103F I University Research Initiatives
--	---

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	206.192	182.372	158.784	0.000	158.784
Current President's Budget	191.797	182.372	143.372	0.000	143.372
Total Adjustments	-14.395	0.000	-15.412	0.000	-15.412
• 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	-7.547	0.000			
• Other Adjustments	-6.848	0.000	-15.412	0.000	-15.412

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 615094: *University Research Initiatives*

Congressional Add: *Program increase: Defense university research instrumentation program*

Congressional Add: *CPF-GHz-THz Antenna Systems*

Congressional Add Subtotals for Project: 615094

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	28.902	0.000
	4.817	0.000
	33.719	0.000
	33.719	0.000

**Change Summary Explanation**

Decrease in FY 2025 is due to Space-focused basic research transferring to 3620F: Research, Development, Test & Evaluation, Space Force; Program Element 0601103SF, University Research Initiatives; Project 610002: University Research Initiatives - Space.

**C. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
<b>Title:</b> Multidisciplinary University Research Initiative	85.362	96.372	77.785	0.000	77.785
<b>Description:</b> Promote fundamental, multi- and interdisciplinary science and engineering research projects involving multiple principal investigators.					
<b>FY 2024 Plans:</b> Enhance the program and fund competitive research grants at U.S. universities that focus on significantly expanding the basic knowledge of Department of the Air Force-relevant science and technology areas. Focus					

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force</i> / BA 1: <i>Basic Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0601103F / <i>University Research Initiatives</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
<p>on complex research efforts not normally achievable in smaller funded, single investigator awards. Support and recognize superior academic researchers in the early stages of their careers through the Presidential Early Career Award for Scientists and Engineers program. Fund the existing multi-year, multidisciplinary awards and receive proposals from universities to fund next round of multidisciplinary research grants. The FY 2024 Multidisciplinary University Research topics are: Plasmon-Controlled Single-Atom Catalysis; A New Mathematical Paradigm for Integrating Data, Models, Decisions; AIN Semiconductors for High-Power Electronics; Compositionally Complex Ceramics (CCCs) via Knowledge-Guided Pyrolysis for Hypersonics; Piezoelectric Materials Interfaced with Semiconductors for Integrated Quantum Systems; Space-Based Characterization of Arctic Permafrost Dynamics; Modeling and Measuring Multilevel Resonance; Fundamental Limits of Passive Heterodyne Photodetection of Incoherent, Broadband Sources; and Tensor Networks and Low-Rank Methods for High-Dimensional Computing.</p> <p><b>FY 2025 Base Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue enhancing the program and continue funding competitive research grants at U.S. universities that focus on significantly expanding the basic knowledge of Department of the Air Force-relevant science and technology areas.</li> <li>- Continue to focus on complex research efforts not normally achievable in smaller funded, single investigator awards.</li> <li>- Continue to support and recognize superior academic researchers in the early stages of their careers through the Presidential Early Career Award for Scientists and Engineers program.</li> <li>- Continue funding the existing multi-year, multidisciplinary awards and receive proposals from universities to fund next round of multidisciplinary research grants.</li> <li>- Note: In FY 2025 and beyond some multidisciplinary university research initiative efforts will be accomplished in 3620F: Research, Development, Test &amp; Evaluation, Space Force; Program Element 0601103SF, University Research Initiatives; Project 610002: University Research Initiatives - Space.</li> </ul> <p><b>FY 2025 OCO Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by 18.587 million. Funding decreased due to movement of effort to USSF program as shown in FY 2025 plans, and due to Air Force funding re-prioritization.</p>					
<b>Title:</b> Science and Engineering Education	56.908	62.000	51.362	0.000	51.362

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force</i> / BA 1: <i>Basic Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0601103F / <i>University Research Initiatives</i>	

**C. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
<p><b>Description:</b> Support post-graduate, graduate, and undergraduate education in science and engineering disciplines at U.S. universities.</p> <p><b>FY 2024 Plans:</b> Enhance the program and continue to award highly competitive National Defense Science and Engineering Graduate fellowships. Support competitive awards for graduate and undergraduate research experiences, including those established under the Awards to Stimulate and Support Undergraduate Research Experiences program. Fund awards initiated under prior year DoD programs.</p> <p><b>FY 2025 Base Plans:</b> - Continue enhancing the program and continue to award highly competitive National Defense Science and Engineering Graduate fellowships. - Continue to support competitive awards for graduate and undergraduate research experiences, including those established under the Awards to Stimulate and Support Undergraduate Research Experiences program. - Continue funding for awards initiated under prior year DoD programs.</p> <p><b>FY 2025 OCO Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$10.638 million. Funding decreased due to decreased emphasis in this effort.</p>					
<p><b>Title:</b> Research Instrumentation</p> <p><b>Description:</b> Enhance scientific and engineering research through advanced education infrastructure and instrumentation at U.S. universities.</p> <p><b>FY 2024 Plans:</b> Enhance the program and award grants on a competitive basis under the Defense University Research Instrumentation Program to U.S. universities to acquire state-of-the-art, high technology instrumentation and infrastructure to enhance research and educational capabilities.</p> <p><b>FY 2025 Base Plans:</b></p>	15.808	24.000	14.225	0.000	14.225

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 1: Basic Research	<b>R-1 Program Element (Number/Name)</b> PE 0601103F I University Research Initiatives
--	---

**C. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
- Continue enhancing the program and award grants on a competitive basis under the Defense University Research Instrumentation Program to U.S. universities to acquire state-of-the-art, high technology instrumentation and infrastructure to enhance research and educational capabilities. - Note: In FY 2025 and beyond some research instrumentation efforts will be accomplished in 3620F: Research, Development, Test & Evaluation, Space Force; Program Element 0601103SF, University Research Initiatives; Project 610002: University Research Initiatives - Space.  <b>FY 2025 OCO Plans:</b> Not Applicable  <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$9.775 million. Funding decreased due to movement of effort to USSF program as shown in FY 2025 plans, and decreased emphasis in this effort.					
<b>Accomplishments/Planned Programs Subtotals</b>	158.078	182.372	143.372	0.000	143.372

	FY 2023	FY 2024
<b>Congressional Add:</b> Program increase: Defense university research instrumentation program <b>FY 2023 Accomplishments:</b> Conducted Congressionally directed effort. <b>FY 2024 Plans:</b> Not Applicable	28.902	0.000
<b>Congressional Add:</b> CPF-GHz-THz Antenna Systems <b>FY 2023 Accomplishments:</b> Conducted Congressionally directed effort. <b>FY 2024 Plans:</b> Not Applicable	4.817	0.000
<b>Congressional Adds Subtotals</b>	33.719	0.000

**D. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

Not Applicable

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602020F / <i>Future AF Capabilities Applied Research</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	93.684	90.713	85.477	0.000	85.477	90.742	93.428	97.709	99.895	Continuing	Continuing
620200: <i>Enterprise Transformational Appld Research</i>	-	93.684	90.713	85.477	0.000	85.477	90.742	93.428	97.709	99.895	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program element develops multidisciplinary applied research efforts to accelerate the technology pipeline of transformational capabilities by reducing risk and maturing technologies so they can transition in support of larger advanced technology development capability investments. These activities are selected to enable solutions to the Department of the Air Force (DAF)s highest priorities. The Explore effort engages traditional & non-traditional industry, government laboratories, and academia through 12-24 month feasibility studies and demonstrations. The Seedlings for Disruptive Capabilities Program (SDCP) facilitates Air Force Research Laboratory (AFRL) cross-disciplinary applied research to provide leap-ahead, high risk technology development. Modeling, simulation, and analysis activities will continue to explore transformational research analytic technologies to enable validated positions and provide a solid foundation with emphasis to predict future outcomes and technology needs, as well as looking for more seedlings to feed the transformational capability pipeline. Efforts will advance future workforce development projects and will broaden partnerships to deepen and expand the scientific and technology enterprise. Applied research efforts span a broad spectrum of activities, and established processes allow agility and flexibility to meet higher demand signals.

AFRL will plan and manage these funds at the enterprise level to achieve a high level of collaboration executed across all the applicable Technology Directorates and will apply the research toward disruptive capabilities. Building off the technology competencies and ecosystems of the Technology Directorates brings together the needed expertise and components to develop the transformational capabilities.

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 program element would be executed in the Technology Directorates in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602020F / <i>Future AF Capabilities Applied Research</i>
---	--

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	99.901	90.713	91.293	0.000	91.293
Current President's Budget	93.684	90.713	85.477	0.000	85.477
Total Adjustments	-6.217	0.000	-5.816	0.000	-5.816
• 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	-2.670	0.000			
• Other Adjustments	-3.547	0.000	-5.816	0.000	-5.816

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 620200: *Enterprise Transformational Appld Research*

Congressional Add: *Program increase - alternative energy research*

Congressional Add Subtotals for Project: 620200

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	19.268	-
	19.268	-
	19.268	-

**Change Summary Explanation**

FY 2025 decrease \$3.500M funding is due to transfer into USSF Program Element 1026601SF/Space Technology, Project 620200/Enterprise Transformational Appld Research.

**C. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Transformational Capability Incubator	74.416	0.000	0.000
<b>Description:</b> This effort was previously titled "AF Explore" but was updated to include USSF support. Integrates cross-enterprise multi-directorate transformational applied research efforts to accelerate the "pipeline" of technology-enabled capability candidates pursuing the five strategic capabilities outlined in the Air Force Science and Technology Strategy. The Air Force Research Laboratory will plan and manage these research activities at the enterprise level with decentralized execution to achieve the intent of the Strategy.			
<b>FY 2024 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>		<b>R-1 Program Element (Number/Name)</b> PE 0602020F <i>I Future AF Capabilities Applied Research</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
To clarify intent, the activities from this effort have been realigned into three discrete thrusts: Explore, Seedlings for Disruptive Capabilities, and Data to Decisions and Collaborative Learning.				
<b>FY 2025 Plans:</b> Not applicable.				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not applicable.				
<b>Title:</b> Explore		0.000	38.075	38.093
<b>Description:</b> Explore engages traditional & non-traditional industry, government labs and academia through competitive opportunity calls to incubate transformational Science and Technology (S&T). Its strategy-informed construct works to uncover game-changing and leap-ahead technologies that address DAF future force priorities. Explore's three-step process identifies, invests in, and matures these technologies through 12-24 month feasibility studies and proof of concept activities. The technology areas are identified through concept decomposition, horizon-scanning, and broad competitive calls to the nation's best and brightest innovators in industry, academia, government, non-profits, and other non-traditional partners. Promising technologies are accelerated through aggressive, short duration applied research and development efforts. These efforts assess operational viability and demonstrate feasibility of transformational warfighter capabilities, including their associated business and use cases. To do this, a variety of approaches are used including modeling and simulation, military utility experimentation, exercise participation, technical analysis, technology/concept maturation, risk reduction activities, and subject matter expertise input. Explore informs future areas of research and aids in identifying emerging technologies which could enable larger advanced technology development capability investments.				
<b>FY 2024 Plans:</b> Funding identified previously as part of the overall "Transformational Capability Incubators" effort. Initiate efforts which support immediate priorities of the Department of the Air Force which may include, but are not limited to, transformational needs within the intelligence, surveillance, and reconnaissance envelope to include data support, software tools, automation, and machine learning; impacting adversaries kill chain and technology in kill chain analysis; affordable weapons to include weapon transfer/loading, high speed affordable weapons, and delivery mechanisms to include the use of decoys; alternative positioning, navigation, and timing technologies; and novel computing and communication approaches. Continue investments in multiple energy solutions such as those to explore loader technologies, rechargeable energy solutions, flexible power generation, renewable power generation, energy storage, energy transfer, and wireless power distribution for agile combat employment, new engine technology, and transformative ways to provide power to an aircraft or forward operating location. Continue investments in universal support equipment to include new capabilities and technology to support flightline support equipment and generate new capabilities that will support agile combat employment operations. Continue investments in electronic warfare to include				

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>		<b>R-1 Program Element (Number/Name)</b> PE 0602020F <i>I Future AF Capabilities Applied Research</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>autonomous modeling and simulation at the edge, resilient communications, and algorithm development. Continue investments in distributed command and control including technology within distributed human-human teaming leveraging complex machine tools, AI enabled planning for contested environments, and workflow-based system-of-systems deployment. Continue investments in fog and edge computing to include computing solutions to process sensor data in real time, generate insights, and interact with the data in a distributed manner with the ability to send data to the cloud for additional processing. This further includes human computer interface technologies, energy efficient computing and architecture for data collection and processing, and collaborative computing, fusion, and networking. Complete initial investments in resilient distributed command and control including technology within distributed human-human teaming leveraging complex machine tools, AI enabled planning for contested environments, and workflow-based system-of-systems deployment. Complete investments in runway independence to include vertical takeoff and landing.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Initiate efforts which support immediate priorities of the Department of the Air Force (DAF) within areas of building blue kill chains, breaking red kill chains, contested logistics, and command, control, and communications battle management (C3BM)</li> <li>- Continue investments that were established to support immediate priorities of the DAF which may include, but are not limited to, transformational needs within: <ul style="list-style-type: none"> <li>-- Intelligence, surveillance, and reconnaissance to include data support, software tools, autonomy, and machine learning and impacting adversaries kill chain and technology in kill chain analysis.</li> <li>-- Future connected, survivable, and agile Autonomous Air-to-Air Refueling platforms to deliver fuel leveraging enterprise activities in autonomy and air vehicle design.</li> <li>-- Multiple energy solutions such as those to explore loader technologies, rechargeable energy solutions, flexible power generation, renewable power generation, energy storage, energy transfer, wireless power distribution for agile combat employment, new engine technology, and transformative ways to provide power to an aircraft or forward operating location.</li> </ul> </li> <li>- Complete investments in fog and edge computing to include computing solutions to process sensor data in real time, generate insights, and interact with the data in a distributed manner with the ability to send data to the cloud for additional processing. This further includes human computer interface technologies, energy efficient computing, architecture for data collection and processing, and collaborative computing, fusion, and networking.</li> <li>- Complete investments in common support equipment that include new capabilities and technology to support flightline support equipment and generate new capabilities that will support agile combat employment operations.</li> <li>- Complete investments in electronic warfare to include autonomous modeling and simulation at the edge, resilient communications, and algorithm development.</li> <li>- Complete investments in high-speed affordable weapons</li> <li>- Complete initial investments in counter-intelligence, surveillance, and reconnaissance</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>				

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602020F / <i>Future AF Capabilities Applied Research</i>
---	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

FY 2025 decreased compared to FY 2024 by 0.018 million as a result of a transfer of 2.364 to USSF Program Element 1206601SF/Space Technology, Project 620200/Enterprise Transformational Appld Research. This effort sees an increased emphasis on renewable energy, future blue capabilities, logistics, and command, control, and communications.			
---	--	--	--

<b>Title:</b> Seedlings for Disruptive Capabilities (SDCP)	0.000	31.700	33.257
--	-------	--------	--------

**Description:** Integrates cross-enterprise multi-directorate transformational applied research efforts to accelerate the pipeline of technology-enabled capability candidates pursuing the Department of the Air Force Operational Imperatives. Seedlings for Disruptive Capabilities solicit applied research to provide leap-ahead, high risk technology development. Significantly advances scientific progress of innovative concepts underpinning transformational operational capabilities to future forces, enhance organic AFRL research capabilities in an enterprise-level, cross-Directorate environment & fortify external research partnerships to leverage key emerging technology developments in academia, industry, and/or government laboratories. The Air Force Research Laboratory will plan and manage these research activities at the enterprise level with decentralized execution to achieve the intent of the strategy.

**FY 2024 Plans:**

Effort previously incorporated as part of the FY23 effort called "Transformational Capability Incubator". Initiate efforts which support immediate priorities of the Department of the Air Force by implementing cross-disciplinary applied research to provide leap-ahead, high risk technology development in areas such as extended range weapons, coherent radars for increase detection of UAVs, wideband agile RF communications, networking quantum, or scalable affordable phased arrays for Space. Complete research in defending aircraft with next-generation targeted electromagnetics - electronic attack and counter electronic capabilities. Complete research in in-band lethality against seeker threats - modes of lethality for directed energy. Complete research in magnetic and star tracking for extended range navigation - accurate navigation over water. Complete research in photonic integrated circuits for space communications, position, navigation, and timing - architectures resilient to GPS denial. Continue research in infrastructure for trusted satellite autonomy for tactical rapid adversarial protection - safe, high assurance autonomy methodologies and human-autonomy interactions to react, plan and decide on appropriate actions in space. Continue research in spectral/polarization-sensitive event-based camera for intelligence, reconnaissance, and surveillance air moving target indicator - only reports changes in scene dynamics with enhanced target identification and real-world predictive power. Continue research in "Rainfly" - novel artificial intelligence-enabled methodologies to discover and characterize adversaries' defense systems to gain insight into organizational functionality.

**FY 2025 Plans:**

- Initiate efforts which support immediate priorities of the Department of the Air Force by implementing cross-disciplinary applied research to provide leap-ahead, high risk technology development in areas such as RF communications for high altitude platforms.

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602020F / <i>Future AF Capabilities Applied Research</i>
---	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Initiate programs in optical atomic clocks for advanced alternative PNT, laser resilient optical mirrors for ground and space-based imagery systems, high-voltage gallium oxide radio-frequency static induction transistors for dramatic increase in radar power density, and passively augmented LIDAR for attritable sensing in contested environments</p> <p>- Complete research in infrastructure for trusted satellite autonomy for tactical rapid adversarial protection - safe, high assurance autonomy methodologies and human-autonomy interactions to react, plan and decide on appropriate actions in space battle management.</p> <p>- Complete research in spectral/polarization-sensitive event-based cameras for intelligence, reconnaissance, and surveillance air moving target indicator; only reports changes in scene dynamics with enhanced target identification and real-world predictive power.</p> <p>- Complete research in "Rainfly" - novel artificial intelligence-enabled methodologies to discover and characterize adversaries' defense systems to gain insight into organizational functionality.</p> <p>- Continue research in distributed coherent radars for UAV swarms developing magnitude improvements in detection range and target location accuracy.</p> <p>- Continue research in optimizing and affordably manufacturing long range weapons.</p> <p>- Continue research in wideband agile RF communications for high altitude modular platforms enabling a proliferated network of sensors to operate in contested environments.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$1.557 million. Increase is a result of maturing seedling topics of coherent UAV radars, long range weapons, and wideband agile RF into full lines of effort.</p>			
<p><b>Title:</b> Data to Decisions and Collaborative Learning</p> <p><b>Description:</b> Perform modeling, simulation, and analyses assessing the military utility of candidate transformational component applied research investments. Enhance the use of advanced systems for decision-making and a variety of innovations required to connect experts with operators in pursuit of achieving future force capabilities through applied research. Leverage best-in-class data analytics that connect warfighters with scientists and engineers, and innovating laboratory processes to accelerate technology maturation. Conduct a variety of strategic enterprise-level activities, including but not limited to regional campus hubs, scientists and engineers working with the leading national innovators; promoting technical proficiency in our military members, centers for excellence, and the Air Force Research Laboratory (AFRL) Front Door. AFRL collaborates with thousands of subject matter experts inside and outside government, academia, and industry enhancing and developing DoD relevant capabilities. Implements continuous lab process innovation via Air Force "TechConnect" tools connecting people with people and building a pipeline of ideas from external sources; leveraging AI-fueled tech connect platforms and supporting future force capabilities with real-time feedback loops through these tools, data analytics, and new connections to non-traditional partners.</p> <p><b>FY 2024 Plans:</b></p>	0.000	20.938	14.127

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602020F / <i>Future AF Capabilities Applied Research</i>
---	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Effort previously incorporated as part of the FY23 effort called "Transformational Capability Incubator". Continue modeling, simulation, &amp; analyses enabling validated positions and providing a solid foundation for predicting future outcomes. Continue Air Force Research Laboratory's tech connect platforms connecting entrepreneurs, small business, industry, academia, &amp; military with Air Force and Space Force science and technology ecosystem. Continue internships and undergraduate research opportunities to build the science and technology workforce pipeline. Continue "Savage Future", connecting warfighters with the science and technology community, enabling understanding of both the problems and optimal solutions to accelerate results. Continue the Edison Grant program building the military science and engineering pipeline by promoting technical proficiency of our uniformed scientists and engineers.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue modeling, simulation, &amp; analyses enabling validated positions and providing a solid foundation for predicting future outcomes</li> <li>- Continue Air Force Research Laboratory's tech connect platforms connecting entrepreneurs, small business, industry, academia, &amp; military with Air Force and Space Force science and technology ecosystem</li> <li>- Continue internships and undergraduate research opportunities to build the science and technology workforce pipeline.</li> <li>- Continue "Savage Future", connecting warfighters with the science and technology community, enabling understanding of both the problems and optimal solutions to accelerate results.</li> <li>- Continue the AFRL MidAtlantic and MidWest Regional Networks, building a collaborative network of small business, large business, academia, and ventures to risk reduce key dual purpose technology solutions addressing DAF priorities.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$6.811 million as a result of a transfer to USSF Program Element 1206601SF/Space Technology, Project 620200/Enterprise Transformational Appld Research.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	74.416	90.713	85.477

	<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Program increase - alternative energy research	19.268	-
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts.		
<b>Congressional Adds Subtotals</b>	19.268	-

**D. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

**Appropriation/Budget Activity**  
3600: *Research, Development, Test & Evaluation, Air Force I BA 2: Applied Research*

**R-1 Program Element (Number/Name)**  
PE 0602020F *I Future AF Capabilities Applied Research*

**E. Acquisition Strategy**

N/A



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602022F I <i>University Affiliated Research Center (UARC) - Tactical Autonomy</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	0.000	8.018	8.225	0.000	8.225	8.417	8.576	8.757	8.941	Continuing	Continuing
622408: <i>HBCU University Affiliated Research Center (UARC)</i>	-	0.000	8.018	8.225	0.000	8.225	8.417	8.576	8.757	8.941	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Tactical Autonomy University Affiliated Research Center (UARC) supports a consortium performing innovative research to advance the state of the art as well as cultivate awareness of and expertise in the field of tactical autonomy. Research topics of interest include, but are not limited to, the following: Trust in Mission Autonomy, Collaboration between Platforms, and Human Machine Teaming.

Funds in this program element are planned to investigate, design, develop, digitize, and/or analyze specified technology advancements in air, space, ground, sea, and/or cyber domains. This research will address factors that have complicated the deployment and adoption of autonomous technologies such as trust in mission autonomy, collaboration between platforms, and human-machine teaming. Research will also seek to integrate autonomous technologies with advanced battle management systems. The UARC will also work to expand the defense industrial base by identifying and incorporating applicable technologies from small businesses.

This research initiative will support the Department of Defense Science, Technology, Engineering, and Mathematics (STEM) strategic plan by establishing long-term core research expertise in tactical autonomy that will leverage scientific and engineering capabilities among the consortium of contributing HBCUs. Tactical autonomy will be a critical technology in prolonged great power conflict because the development of autonomous systems is a realistic approach to counter an advisory approaching parity in conventional strength in theatre, and tactical autonomy will enable warfighting capability in an environment where command and control may be disrupted by cyber or electronic warfare effects. This research will contribute to operational warfighting capabilities by increasing the capabilities of uncrewed platforms that will have greater availability, easier mobility and logistical sustainability, and shorter production cycle times. Research will produce creative solutions to optimize the capabilities of reliable data-driven autonomous platforms capable of operating in environments well suited to uncrewed systems, such as persistent defensive or force protection-related missions, or in high-risk environments such as heavy anti-access or Nuclear, Chemical, Biological (NBC) affected settings. One of the foremost advantages of the United States in great power competition is its advanced university-based scientific research institutions. This research initiative will strengthen HBCU scientific and engineering capabilities, advance the early career development of STEM students, leverage the research contributions of university faculty, and expand the pipeline of STEM graduates with national security experience for the government and the private-sector defense industrial base.

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.

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602022F I <i>University Affiliated Research Center (UARC) - Tactical Autonomy</i>
---	---

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	0.000	8.018	8.208	0.000	8.208
Current President's Budget	0.000	8.018	8.225	0.000	8.225
Total Adjustments	0.000	0.000	0.017	0.000	0.017
• 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	0.017	0.000	0.017

**Change Summary Explanation**

FY 2025 funding increased compared to FY 2024 by \$0.017 million due to anticipated escalation for prime contract labor and other direct costs in line with macroeconomic conditions.

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<b>Title:</b> University Affiliated Research Center (UARC) For Tactical Autonomy	-	8.018	8.225
<b>Description:</b> Development of technologies and tools to enable autonomous systems to act with delegated and bounded authority of humans in support of tactical, short-term actions, associated with longer-term strategic visions. Examples of capability objectives are: Enhancing multi-domain situational awareness, faster data processing and analysis, enhancing force protection, supporting cyber defense, augmenting logistics operations, and automating maneuverability and mobility functions.			
<b>FY 2024 Plans:</b> The base funding year will enable research to commence by the UARC consortium members to start to support development of technologies and tools to enable autonomous systems to act with delegated and bounded authority of humans in support of tactical, short-term actions, associated with longer-term strategic visions. Initial work is planned to start among an estimated thirty-six technical requirements this first fiscal year of funding with a primary focus toward the Collaborative Combat Aircraft (CCA).			
<b>FY 2025 Plans:</b> Continuation of the development of technologies and tools to enable autonomous systems to act with delegated and bounded authority of humans in support of tactical, short-term actions, associated with longer-term strategic visions.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602022F I <i>University Affiliated Research Center (UARC) - Tactical Autonomy</i>
---	---

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 budget increased compared to FY 2024 by \$0.207 million for escalation as negotiated in the prime contract for labor and other direct costs.			
<b>Accomplishments/Planned Programs Subtotals</b>	-	8.018	8.225

**D. Other Program Funding Summary (\$ in Millions)**  
N/A

**Remarks**  
The HBCU Tactical Autonomy UARC will be co-funded by the Office of the Under Secretary of Defense (Research and Engineering) and the Office of the Under Secretary of Defense (Acquisition and Sustainment).

**E. Acquisition Strategy**  
Not applicable

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	266.944	142.325	142.336	0.000	142.336	140.195	143.747	155.328	158.451	Continuing	Continuing
624347: <i>Materials for Structures, Propulsion, and Subsystems</i>	-	167.690	54.318	54.816	0.000	54.816	56.169	57.478	62.529	63.780	Continuing	Continuing
624348: <i>Materials for Electronics, Optics, and Survivability</i>	-	53.307	39.593	39.561	0.000	39.561	40.423	41.306	43.989	44.884	Continuing	Continuing
624349: <i>Materials Technology for Sustainment</i>	-	45.947	48.414	47.959	0.000	47.959	43.603	44.963	48.810	49.787	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops advanced materials, processing, and inspection technologies to reduce life cycle costs and improve performance, sustainability, availability, affordability, supportability, reliability, and survivability of current and future Department of the Air Force systems and operations. The program has three projects that develop: structural, propulsion, and sub-systems materials and processes technologies; electronic, optical, and survivability materials and processes technologies; and sustainment materials, processes technologies, and advanced non-destructive inspection methodologies. Efforts in the program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

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

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 the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>
---	--

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	275.945	142.325	141.219	0.000	141.219
Current President's Budget	266.944	142.325	142.336	0.000	142.336
Total Adjustments	-9.001	0.000	1.117	0.000	1.117
• 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	-10.010	0.000			
• SBIR/STTR Transfer	-3.745	0.000			
• Other Adjustments	4.754	0.000	1.117	0.000	1.117

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 624347: *Materials for Structures, Propulsion, and Subsystems*

	<b>FY 2023</b>	<b>FY 2024</b>
Congressional Add: <i>Program increase - born qualified additive manufacturing</i>	9.864	0.000
Congressional Add: <i>Program increase - high and ultra-high temperature ceramic-matrix composites for hypersonics</i>	9.864	0.000
Congressional Add: <i>Program increase - additive manufacturing of alloys</i>	9.864	0.000
Congressional Add: <i>Program increase - high energy synchotron x-ray research</i>	8.878	0.000
Congressional Add: <i>Program increase - maturation of carbon-carbon thermal protection systems</i>	4.932	0.000
Congressional Add: <i>Program increase - additive manufactured ceramic matrix composites</i>	4.932	0.000
Congressional Add: <i>Program increase - catalytic architectures for ASCENT satellite maneuverability</i>	5.918	0.000
Congressional Add: <i>Program increase - computationally-driven next generation carbon composite material development</i>	4.932	0.000
Congressional Add: <i>Program increase - materials for high-energy fuels</i>	9.864	0.000
Congressional Add: <i>Program increase - modeling ultra high temperature materials for hypersonics</i>	9.864	0.000
Congressional Add: <i>Program increase - scanning and additive manufacturing</i>	1.479	0.000
Congressional Add: <i>Program increase - accelerated material development for high mach capabilities</i>	9.864	0.000
Congressional Add: <i>Program increase - disruptive alloy metals development</i>	9.864	0.000
Congressional Add: <i>Program Increase - Deployable passive cooling</i>	4.932	0.000

Congressional Add Subtotals for Project: 624347 105.051      0.000

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>
---	--

<b>Congressional Add Details (\$ in Millions, and Includes General Reductions)</b>	<b>FY 2023</b>	<b>FY 2024</b>
<b>Project: 624348: <i>Materials for Electronics, Optics, and Survivability</i></b>		
Congressional Add: <i>Program increase - small satellite technology</i>	19.729	0.000
Congressional Add Subtotals for Project: 624348	19.729	0.000
<b>Project: 624349: <i>Materials Technology for Sustainment</i></b>		
Congressional Add: <i>Program increase - transparency repair program</i>	4.587	0.000
Congressional Add: <i>Program increase - flexible conductive materials</i>	4.932	0.000
Congressional Add: <i>Program increase - electromagnetic protected advanced lightweight multifunctional materials</i>	4.932	0.000
Congressional Add Subtotals for Project: 624349	14.451	0.000
Congressional Add Totals for all Projects	139.231	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>				<b>Project (Number/Name)</b> 624347 / <i>Materials for Structures, Propulsion, and Subsystems</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
624347: <i>Materials for Structures, Propulsion, and Subsystems</i>	-	167.690	54.318	54.816	0.000	54.816	56.169	57.478	62.529	63.780	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops the materials and processing technology base for aircraft, spacecraft, launch systems, and missiles to improve affordability, maintainability, and performance of current and future Department of the Air Force systems. A family of affordable lightweight materials is being developed, including metals, polymers, ceramics, metallic and nonmetallic composites, and hybrid materials to provide upgraded capabilities for existing aircraft, missile, and propulsion systems to meet the future system requirements. The project develops high-temperature turbine engine materials that will enable engine designs to improve turbine engine thrust-to-weight ratio, specific fuel consumption and affordability. Advanced high temperature protection materials are being developed that are affordable, lightweight, dimensionally stable, thermally conductive, and/or ablation and erosion resistant to meet aerospace and missile requirements. Alternative or replacement materials are being developed to maintain the performance of fielded operational systems. The project concurrently develops advanced processing methods to enable adaptive processing of aerospace materials.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Ceramics and Composites	35.357	27.263	27.002
<b>Description:</b> Develop ceramic, polymer, polymer and ceramic matrix composites, and hybrid materials technologies for performance and supportability improvement in propulsion systems and high temperature aerospace structures.			
<b>FY 2024 Plans:</b> Continue validating, demonstrating, and maturing new advanced processing methods, coating technologies, and behavioral life prediction concepts for current and future higher capability polymer and ceramic matrix composites. Continue in-depth analyses and assessment of severe environment durability of advanced composite systems via mechanical testing. Continue validating, developing, and testing the new ceramic and polymer matrix composite materials and processes with higher temperature capability for next generation propulsion systems and aerospace structures. Continue advancing and integrating the computational material science infrastructure for composite materials in tools to model, characterize, and accelerate the development and certification of advanced composite materials. Continue verifying and validating damage progression models on increasingly complex polymer matrix composite structural applications. Continue developing and validating newer testing and assessment methods on composite damage progression models for application in an engineering environment. Continue developing and validating advanced materials to meet evolving requirements for structural hardening. Continue development and refinement modeling tools to link processing to performance of organic/polymer matrix composites and expand damage mechanics models to increasingly complex composite materials.			
<b>FY 2025 Plans:</b>			



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624347 / <i>Materials for Structures, Propulsion, and Subsystems</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue validating, demonstrating, and maturing new advanced processing methods, coating technologies, and behavioral life prediction concepts for current and future higher capability polymer and ceramic matrix composites.</li> <li>- Continue in-depth analyses and assessment of severe environment durability of advanced composite systems via mechanical testing.</li> <li>- Continue validating, developing, and testing the new ceramic and polymer matrix composite materials and processes with higher temperature capability for next generation propulsion systems and aerospace structures.</li> <li>- Continue advancing and integrating the computational material science infrastructure for composite materials in tools to model, characterize, and accelerate the development and certification of advanced composite materials.</li> <li>- Continue verifying and validating damage progression models on increasingly complex polymer matrix composite structural applications.</li> <li>- Continue developing and validating newer testing and assessment methods on composite damage progression models for application in an engineering environment.</li> <li>- Continue developing and validating advanced materials to meet evolving requirements for structural hardening.</li> <li>- Continue development and refinement modeling tools to link processing to performance of organic/polymer matrix composites and expand damage mechanics models to increasingly complex composite materials.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$0.261 million. Funding increase as described in the above plans.</p>				
<p><b>Title:</b> Metals</p> <p><b>Description:</b> Develop lightweight and high temperature metallics, life prediction technologies, and metals processing technologies for increased affordability, durability, and reliability of Department of the Air Force systems.</p> <p><b>FY 2024 Plans:</b> Continue validating, demonstrating, and implementing advanced computation methods to support faster material development and characterization modeling. Continue analyzing relationships between microstructure, processing, properties, and performance of affordable metallic and high performance gradient metallic materials. Continue validating integrated material/manufacturing and component analysis for life management and development of affordable structural metals and low cost processes. Continue advancing reliable affordable metallic structural components through computational methods. Continue validating the value of integrated analytical tools in the optimization of design and certification of additively manufactured metallic components. Continue development of novel capabilities via metallic additive manufacturing to be used as an alternative process when applicable. Continue developing and refining processing methods and affordable metals for low cost, attritable propulsion systems. Continue</p>		18.576	18.490	18.313

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624347 / <i>Materials for Structures, Propulsion, and Subsystems</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>research on application of advanced data science, artificial intelligence and machine learning on materials science problems. Complete research on engine life prediction.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue validating, demonstrating, and implementing advanced computation methods to support faster material development and characterization modeling.</li> <li>- Continue analyzing relationships between microstructure, processing, properties, and performance of affordable metallic and high performance gradient metallic materials.</li> <li>- Continue validating integrated material/manufacturing and component analysis for life management and development of affordable structural metals and low-cost processes.</li> <li>- Continue advancing reliable affordable metallic structural components through computational methods.</li> <li>- Continue validating the value of integrated analytical tools in the optimization of design and certification of additively manufactured metallic components.</li> <li>- Continue development of novel capabilities via metallic additive manufacturing to be used as an alternative process when applicable.</li> <li>- Continue developing and refining processing methods and affordable metals for low cost, attritable propulsion systems.</li> <li>- Continue research on application of advanced data science, artificial intelligence and machine learning on materials science problems.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$0.177 million. Funding decrease is described in the above plans.</p>			
<p><b>Title:</b> Thermal Protection Materials</p> <p><b>Description:</b> Develop and evaluate lightweight, active, adaptive, multifunctional, high temperature, and durable material systems for extreme environments and hypersonic applications.</p> <p><b>FY 2024 Plans:</b> Continue validating and maturing processing methods for fabricating materials required for expendable hypersonic applications. Continue validating, developing, and refining unique experimental techniques to assess mechanical properties and time-dependent behavior. Continue validating and demonstrating material properties and performance to meet design needs for control surfaces, leading edges, aeroshells, and apertures. Continue development of computational models to assess environmental degradation of materials in a hypersonic environment.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue validating and maturing processing methods for fabricating materials required for expendable hypersonic applications.</li> </ul>	5.594	5.453	5.401

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624347 / <i>Materials for Structures, Propulsion, and Subsystems</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue validating, developing, and refining unique experimental techniques to assess mechanical properties and time-dependent behavior.</li> <li>- Continue validating and demonstrating material properties and performance to meet design needs for control surfaces, leading edges, aeroshells, and apertures.</li> <li>- Continue development of computational models to assess environmental degradation of materials in a hypersonic environment.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$0.053 million. Funding increase is due to increased emphasis in high temperature materials and processes.</p>				
<p><b>Title:</b> Pervasive and Affordable Metals Technologies</p> <p><b>Description:</b> Develop and demonstrate affordable, novel high temperature powder processing materials/structures and additive metals technology concepts to enable future defense capabilities, air vehicle propulsion, and computational prediction models.</p> <p><b>FY 2024 Plans:</b> Continue demonstration of affordable metallic turbine engine disks made via powder processing technologies through high temperature, aggressive environment testing. Continue development of low cost, complex shape metallic components made through additive manufacturing for advanced weapon system component prototypes. Continue development of computational methodologies that incorporate impact of surface residual stress on the ability to extend life and lower life cycle cost of air vehicle propulsion system components.</p> <p><b>FY 2025 Plans:</b> - Continue demonstration of affordable metallic turbine engine disks made via powder processing technologies through high temperature, aggressive environment testing. - Continue development of low cost, complex shape metallic components made through additive manufacturing for advanced weapon system component prototypes. - Continue development of computational methodologies that incorporate impact of surface residual stress on the ability to extend life and lower life cycle cost of air vehicle propulsion system components.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$0.988 million. Funding increase is due to increased emphasis in affordable metals.</p>		3.112	3.112	4.100
<b>Accomplishments/Planned Programs Subtotals</b>		62.639	54.318	54.816

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024	
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624347 / <i>Materials for Structures, Propulsion, and Subsystems</i>	
		<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Program increase - born qualified additive manufacturing		9.864	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - high and ultra-high temperature ceramic-matrix composites for hypersonics		9.864	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - additive manufacturing of alloys		9.864	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - high energy synchrotron x-ray research		8.878	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - maturation of carbon-carbon thermal protection systems		4.932	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - additive manufactured ceramic matrix composites		4.932	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - catalytic architectures for ASCENT satellite maneuverability		5.918	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - computationally-driven next generation carbon composite material development		4.932	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024	
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624347 / <i>Materials for Structures, Propulsion, and Subsystems</i>	
		<b>FY 2023</b>	<b>FY 2024</b>
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - materials for high-energy fuels		9.864	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - modeling ultra high temperature materials for hypersonics		9.864	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - scanning and additive manufacturing		1.479	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - accelerated material development for high mach capabilities		9.864	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - disruptive alloy metals development		9.864	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program Increase - Deployable passive cooling		4.932	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Adds Subtotals</b>		105.051	0.000
<b>C. Other Program Funding Summary (\$ in Millions)</b>			
N/A			
<b>Remarks</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624347 / <i>Materials for Structures, Propulsion, and Subsystems</i>

**D. Acquisition Strategy**

N/A.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>				<b>Project (Number/Name)</b> 624348 / <i>Materials for Electronics, Optics, and Survivability</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
624348: <i>Materials for Electronics, Optics, and Survivability</i>	-	53.307	39.593	39.561	0.000	39.561	40.423	41.306	43.989	44.884	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops materials technologies for the Department of the Air Force's Intelligence, Surveillance, and Reconnaissance (ISR), situational awareness, and specialty coatings for aerospace platforms and munitions. This includes sensors for microwave, short, mid, and long-wave infrared (SWIR, MWIR, LWIR) detection and countermeasures devices used for targeting, electronic warfare, and active aircraft protection. Electronic and optical materials are being developed to enable surveillance and situational awareness with faster operating speeds, greater tunability, higher power output, improved thermal management (including higher operating temperatures), greater sensitivity, and extended dynamic range. This project develops materials for protection of aircrews, sensors, and aerospace structures from directed energy threats without impairing mission effectiveness. Nanostructured and biological materials are being developed for aerospace structures, munitions, aerospace vehicle subsystems, and personnel.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Infrared Detector and Electromagnetic Device Materials	10.557	12.274	12.264
<b>Description:</b> Develop infrared (IR) detector and electro-magnetic device materials and processes technologies for performance, affordability, and operational capability of surveillance, tracking, targeting, and situational awareness systems for the Department of the Air Force.			
<b>FY 2024 Plans:</b> Continue advanced development, demonstration and validation of materials and processes for control and detection of electromagnetic radiation for Intelligence, Surveillance and Reconnaissance (ISR) technologies. Further the development, testing, and assessment of materials for use in high resolution imaging by electromagnetic radiation. Continue advanced demonstration of nanoscale materials, metamaterials, and models for use in producing detectors. Continue utilizing all aspects of computational materials science to improve performance prediction and reliability models, as well as analyzing quantum materials for aerospace applications. Continue specific development and demonstration of short wave infrared detector and hyper-spectral long wave infrared materials. Continue verifying and validating materials and processes for integration of radio frequency and optical signals as well as concepts for novel optical devices and components. Continue development of photonics for aerospace applications, and demonstrate nanostructured materials for components to enable agile radio frequency capability. Continue development of techniques using quantum materials and processes. Continue development of software defined imaging receivers.			
<b>FY 2025 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624348 / <i>Materials for Electronics, Optics, and Survivability</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue advanced development, demonstration and validation of materials and processes for control and detection of electromagnetic radiation for Intelligence, Surveillance and Reconnaissance (ISR) technologies.</li> <li>- Further the development, testing, and assessment of materials for use in high resolution imaging by electromagnetic radiation.</li> <li>- Continue advanced demonstration of nanoscale materials, metamaterials, and models for use in producing detectors.</li> <li>- Continue utilizing all aspects of computational materials science to improve performance prediction and reliability models, as well as analyzing quantum materials for aerospace applications.</li> <li>- Continue specific development and demonstration of short wave infrared detector and hyper-spectral long wave infrared materials.</li> <li>- Continue verifying and validating materials and processes for integration of radio frequency and optical signals as well as concepts for novel optical devices and components.</li> <li>- Continue development of photonics for aerospace applications, and demonstrate nanostructured materials for components to enable agile radio frequency capability.</li> <li>- Continue development of techniques using quantum materials and processes.</li> <li>- Continue development of software defined imaging receivers.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$0.010 million. Funding decrease is described in the above plans.</p>			
<p><b>Title:</b> Directed Energy Hardened Materials</p> <p><b>Description:</b> Develop and demonstrate technologies to enhance the safety, survivability, and mission effectiveness of personnel, sensors, viewing systems, and related Department of the Air Force assets.</p> <p><b>FY 2024 Plans:</b> Continue analyzing, validating, and demonstrating the comprehensive generated data of materials and technologies to protect against directed energy threats. Continue developing and demonstrating advanced optical limiter materials for damage protection, enhanced hybrid materials for advanced applications, and continue to assess the response of new materials for high-energy laser interactions. Continue developing novel approaches for integration of multimodal hardening into structures and devices. Continue assessing data, validating repeatability, and utilizing computational materials science to enhance multi-scale modeling for design of robust, reliable integrated protection. Continue development of proven selected advanced materials technologies to protect against nuclear flash blindness.</p> <p><b>FY 2025 Plans:</b> - Continue analyzing, validating, and demonstrating the comprehensive generated data of materials and technologies to protect against directed energy threats.</p>	10.184	11.878	11.868



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624348 / <i>Materials for Electronics, Optics, and Survivability</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue developing and demonstrating advanced optical limiter materials for damage protection, enhanced hybrid materials for advanced applications, and continue to assess the response of new materials for high-energy laser interactions.</li> <li>- Continue developing novel approaches for integration of multimodal hardening into structures and devices.</li> <li>- Continue assessing data, validating repeatability, and utilizing computational materials science to enhance multi-scale modeling for design of robust, reliable integrated protection.</li> <li>- Complete development of proven selected advanced materials technologies to protect against nuclear flash blindness.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$0.010 million. Funding decrease described in the above plans.</p>				
<p><b>Title:</b> Laser Source Materials</p> <p><b>Description:</b> Develop materials to enable higher performance high power laser sources (quasi-Continuous Wave to Continuous Wave) with emphasis on laser output in the mid-InfraRed spectral region (2-5 microns).</p> <p><b>FY 2024 Plans:</b> Continue demonstrating and validating materials and process technologies to control and generate directed electromagnetic energy for survivability and other applications. Further demonstrate and model materials processes for controlling laser beam direction and focus with optical components and materials for frequency conversion, high power optical isolators, and mid-wave infrared laser sources for directed energy sources.</p> <p><b>FY 2025 Plans:</b> - Continue demonstrating and validating materials and process technologies to control and generate directed electromagnetic energy for survivability and other applications. - Continue to demonstrate and model materials processes for controlling laser beam direction and focus with optical components and materials for frequency conversion, high power optical isolators, and mid-wave infrared laser sources for directed energy sources.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY2025 funding decreased compared to FY 2024 by \$0.002 million. Funding decrease is due to the above plans.</p>		1.491	1.584	1.582
<p><b>Title:</b> Nanostructured and Biological Materials</p> <p><b>Description:</b> Develop enabling and foundational biotechnologies for guidance and control, resilient basing, bio-integrated electronics and sensing for the Department of the Air Force applications.</p> <p><b>FY 2024 Plans:</b></p>		11.346	13.857	13.847

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624348 / <i>Materials for Electronics, Optics, and Survivability</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Continue validating and verifying engineering, scientific, and processing methods for nano and biological materials to address unique requirements for the Department of the Air Force human-machine integration and electronic components. Continue exploring biotechnology to assess the impact of microbes and fungi on Department of the Air Force systems. Continue studying more robust and reliable materials and processes to optimize components for compact, flexible, stretchable multi-functional devices, and validate materials and processes for functional additive manufacturing of electronic components. Continue demonstrating methods to assess reliability and field resiliency of nano and biological materials and processes. Continue supporting the Flexible Hybrid Electronics Institutes for Manufacturing Innovation and the NanoBio Manufacturing Consortium for collaborative teaming. Continue development of agile materials for basing, infrastructure and expeditionary operations.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue validating and verifying engineering, scientific, and processing methods for nano and biological materials to address unique requirements for the Department of the Air Force human-machine integration and electronic components.</li> <li>- Continue studying more robust and reliable materials and processes to optimize components for compact, flexible, stretchable multi-functional devices, and validate materials and processes for functional additive manufacturing of electronic components.</li> <li>- Continue demonstrating methods to assess reliability and field resiliency of nano and biological materials and processes.</li> <li>- Continue supporting the Flexible Hybrid Electronics Institutes for Manufacturing Innovation and the NanoBio Manufacturing Consortium for collaborative teaming.</li> <li>- Continue development of agile materials for basing, infrastructure and expeditionary operations.</li> <li>- Completed exploring biotechnology to assess the impact of microbes and fungi on Department of the Air Force systems.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$0.010 million. Funding decrease as described in the above plans.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	33.578	39.593	39.561

	<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Program increase - small satellite technology	19.729	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.		
<b>FY 2024 Plans:</b> Not applicable		
<b>Congressional Adds Subtotals</b>	19.729	0.000

<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A
---

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602102F / <i>Materials</i>	Project (Number/Name) 624348 / <i>Materials for Electronics, Optics, and Survivability</i>

**C. Other Program Funding Summary (\$ in Millions)**

**Remarks**

**D. Acquisition Strategy**

N/A.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>				<b>Project (Number/Name)</b> 624349 / <i>Materials Technology for Sustainment</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
624349: <i>Materials Technology for Sustainment</i>	-	45.947	48.414	47.959	0.000	47.959	43.603	44.963	48.810	49.787	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops materials and processing technologies to support operational Department of the Air Force mission areas by providing the ability to inspect the quality of delivered systems, transition more reliable and maintainable materials, establish a capability to detect and characterize performance threatening defects, characterize materials processes and properties necessary for materials transition, and provide quick reaction support and failure analysis to the operational commands and repair centers. Repair techniques and nondestructive inspection/evaluation (NDI/E) methods are developed that are needed for metallic and non-metallic structures, coatings, corrosion control processes, and to support integration of composite structures for aerospace systems. Various NDI/E methods are essential to ensure optimum quality in the design and production of aircraft, propulsion, and missile systems. These NDI/E methods are also essential to monitor and detect the onset of any service-initiated damage and/or deterioration due to aging of operational systems.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Material State Awareness	11.172	16.945	16.786
<b>Description:</b> Develop Materials State Awareness technologies to identify and characterize materials and/or damage regardless of scale for managing the health of fielded structures, propulsion systems, and specialty materials, plus enabling advanced materials qualification for Department of the Air Force systems.			
<b>FY 2024 Plans:</b> Continue validating and demonstrating non-destructive evaluation modeling capabilities and use these competencies to drive improvements in capability to detect, characterize and quantify damage in realistic aerospace structures and engine components. Continue analyzing approaches to address the variability inherent in aerospace systems and materials to quantify the impact of that variability on nondestructive inspection capability and reliability. Continue validating advanced sensing technologies to detect and characterize changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. Continue improving methods to acquire and analyze data to facilitate improved characterization, registration, and tracking of degradation and damage of specialty materials that enables/ensures more affordable coatings assessment. Continue validating tools to improve characterization and failure modes of specialty multilayer coatings. Continue developing automation and robotic technologies for visual inspections that will realize human-assisted inspection capabilities and begin to provide capabilities for automated multi-spectral characterization. Continued development of miniaturized nondestructive evaluation/inspection capabilities.			
<b>FY 2025 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624349 / <i>Materials Technology for Sustainment</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue validating and demonstrating non-destructive evaluation modeling capabilities and use these competencies to drive improvements in capability to detect, characterize and quantify damage in realistic aerospace structures and engine components.</li> <li>- Continue analyzing approaches to address the variability inherent in aerospace systems and materials to quantify the impact of that variability on nondestructive inspection capability and reliability.</li> <li>- Continue validating advanced sensing technologies to detect and characterize changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems.</li> <li>- Continue improving methods to acquire and analyze data to facilitate improved characterization, registration, and tracking of degradation and damage of specialty materials that enables/ensures more affordable coatings assessment.</li> <li>- Continue validating tools to improve characterization and failure modes of specialty multilayer coatings.</li> <li>- Continue developing automation and robotic technologies for visual inspections that will realize human-assisted inspection capabilities and begin to provide capabilities for automated multi-spectral characterization.</li> <li>- Continued development of miniaturized nondestructive evaluation/inspection capabilities.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$0.159 million. Funding decrease is due to decrease emphasis in research and development into sustainment of aging aircraft and engines.</p>			
<p><b>Title:</b> Production and Repair Technologies</p> <p><b>Description:</b> Develop support capabilities, information, and processes to resolve problems with materials in the production and repair of systems components and structures for the Department of the Air Force.</p> <p><b>FY 2024 Plans:</b> Continue developing and communicating to the field best practices to ensure repeatability of advanced materials and processes technology to repair and extend the life of Department of the Air Force systems. Further refine through demonstration the understanding of material durability and repair limits for emerging Department of the Air Force systems. Complete the advancement of the analysis and development of improved life cycle prediction test methods and techniques to understand effects of service environments, residual stresses, and material processes on structural and functional materials. Continue improving the service life of advanced materials, processes and designs for improved repair and maintainability and life cycle cost of outer mold line coatings, access panel treatments, and multifunctional systems. Continue to further advance specialty material affordability technologies and processes to reduce maintenance costs of specialty materials.</p> <p><b>FY 2025 Plans:</b> - Continue developing and communicating to the field best practices to ensure repeatability of advanced materials and processes technology to repair and extend the life of Department of the Air Force systems. Further refine through demonstration the understanding of material durability and repair limits for emerging Department of the Air Force systems.</p>	8.003	12.588	12.469

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624349 / <i>Materials Technology for Sustainment</i>

**B. Accomplishments/Planned Programs (\$ in Millions)**

- Continue improving the service life of advanced materials, processes and designs for improved repair and maintainability and life cycle cost of outer mold line coatings, access panel treatments, and multifunctional systems.
- Continue to further advance specialty material affordability technologies and processes to reduce maintenance costs of specialty materials.

**FY 2024 to FY 2025 Increase/Decrease Statement:**

FY 2025 funding decreased compared to FY 2024 by \$0.119 million. Funding decrease is due to reduce emphasis on research and development into sustainment of aging platforms.

**Title:** Failure Analysis Technologies

**Description:** Develop support capabilities, information, and processes to resolve materials problems and provide electronic and structural failure analysis for the Department of the Air Force.

**FY 2024 Plans:**

Continue performing and increasing efficiency of quick response failure analyses and materials investigations. Further the development and investigate improved analysis techniques to determine and prevent root cause materials failure/degradation. Continue developing and providing advanced materials and processing solutions to ensure warfighter systems availability and safety of flight. Continue refining development of functional materials failure analysis capabilities. Continue analyzing and validating advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. Continue transitioning advanced test and characterization methods for analyzing electrical and structural failures of emerging materials. Continue development of new, more durable materials and protection for high power wiring technologies, and advanced materials.

**FY 2025 Plans:**

- Continue performing and increasing efficiency of quick response failure analyses and materials investigations.
- Further the development and investigate improved analysis techniques to determine and prevent root cause materials failure/degradation.
- Continue developing and providing advanced materials and processing solutions to ensure warfighter systems availability and safety of flight.
- Continue refining development of functional materials failure analysis capabilities.
- Continue analyzing and validating advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems.
- Continue transitioning advanced test and characterization methods for analyzing electrical and structural failures of emerging materials.

FY 2023	FY 2024	FY 2025
12.321	18.881	18.704

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602102F / <i>Materials</i>	<b>Project (Number/Name)</b> 624349 / <i>Materials Technology for Sustainment</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
- Continue development of new, more durable materials and protection for high power wiring technologies, and advanced materials.  <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$0.177 million. Funding decrease is due to decreased emphasis on coatings qualifications for legacy platforms.			
<b>Accomplishments/Planned Programs Subtotals</b>	31.496	48.414	47.959

	<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Program increase - transparency repair program <b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts. <b>FY 2024 Plans:</b> Not applicable	4.587	0.000
<b>Congressional Add:</b> Program increase - flexible conductive materials <b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts. <b>FY 2024 Plans:</b> Not applicable	4.932	0.000
<b>Congressional Add:</b> Program increase - electromagnetic protected advanced lightweight multifunctional materials <b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts. <b>FY 2024 Plans:</b> Not applicable	4.932	0.000
<b>Congressional Adds Subtotals</b>	14.451	0.000

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not Applicable.

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	188.407	161.268	5.235	0.000	5.235	4.958	5.061	5.219	5.328	Continuing	Continuing
622401: <i>Structures</i>	-	75.538	67.567	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
622403: <i>Flight Controls and Pilot-Vehicle Interface</i>	-	37.350	39.916	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
622404: <i>Aeromechanics</i>	-	9.233	10.135	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
622405: <i>High Speed Systems Technology</i>	-	62.938	40.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
625172: <i>NUCLEAR SYSTEM TECHNOLOGY</i>	-	3.348	3.624	5.235	0.000	5.235	4.958	5.061	5.219	5.328	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program investigates, develops, and analyzes aerospace vehicle technologies in the primary areas of high speed systems, autonomy and flight control technologies, aeromechanics, structure systems and nuclear system technology. The effort has five current projects, each focusing on a technology area critical to the Department of the Air Force. The High Speed Systems Technology project develops component level vehicle technologies for expendable and reusable high speed/hypersonic aerospace systems. The Flight Controls and Pilot-Vehicle Interface project develops technologies that enable affordable mass and maximum capabilities for manned, remotely-piloted and autonomous aerospace vehicles. The Aeromechanics and Integration project designs advanced aerodynamic vehicle configurations that are developed and analyzed through simulations, experiments, and multi-disciplinary analyses. It also develops design techniques, incorporating vehicle, inter-vehicle, and intra-vehicle control systems. The Structures project develops and exploits new materials, and fabrication processes. The Nuclear System Technology project provides science and technology to preserve nuclear deterrence for future generations.

In FY 2025, the RDT&E Budget Activity 02 (BA02) Aerospace Vehicles Technologies efforts and activities under PE 0602201F, are transferred to PE 0602203F, Aerospace Propulsion for increased integration between airframe, flight control, propulsion, electrical, power and thermal management.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622401 Structures, is transferred to PE 0602203F, Aerospace Propulsion, Project 622401 Structures.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622403, Flight Controls and Pilot-Vehicle Interface, will be transferred to PE 0602203F, Aerospace Propulsion, Project 622403 Flight Controls and Pilot-Vehicle Interface.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622404, Aeromechanics, is transferred to PE 0602203F, Aerospace Propulsion, Project 622401 Structures.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>
---	---

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology, is transferred to PE 0602203F, Aerospace Propulsion, Project 622405 High Speed Systems 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 program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602203F, 0602202F, 0602204F, 0602602F, 0602605F, 0602788F, 0602298F, and 1206601SF.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	199.453	161.268	157.425	0.000	157.425
Current President's Budget	188.407	161.268	5.235	0.000	5.235
Total Adjustments	-11.046	0.000	-152.190	0.000	-152.190
• 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	-0.869	0.000			
• SBIR/STTR Transfer	-3.799	0.000			
• Other Adjustments	-6.378	0.000	-152.190	0.000	-152.190

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 622401: *Structures*

Congressional Add: *Full scale determinant assembly for hypersonic airframe structures*

Congressional Add Subtotals for Project: 622401

**Project:** 622405: *High Speed Systems Technology*

Congressional Add: *Program increase - educational agreement partnership for aerospace engineering security integration*

Congressional Add: *Program increase: educational partnership agreement for secure UAV technologies*

	<b>FY 2023</b>	<b>FY 2024</b>
	9.809	-
	9.809	-
	9.809	-
	9.809	-

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>
---	---

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

Congressional Add: *Program increase: collaborative hypersonic demonstration*

Congressional Add Subtotals for Project: 622405

Congressional Add Totals for all Projects

	FY 2023	FY 2024
	9.809	-
	29.427	-
	39.236	-

**Change Summary Explanation**

FY 2025 funding decreased compared to FY 2024 by \$152.190 million. The decrease is due to the transfer of Aerospace Vehicle Technology efforts to PE 602203F, Aerospace Propulsion.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>				<b>Project (Number/Name)</b> 622401 / <i>Structures</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622401: <i>Structures</i>	-	75.538	67.567	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops advanced structures concepts to exploit new materials and fabrication processes and investigates new concepts and design techniques. New structural concepts include low cost design and fabrication techniques, incorporating subsystem hardware items and adaptive mechanisms into the aerospace structures and/or skin of the platform.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622401 Structures, is transferred to PE 0602203F, Aerospace Propulsion, Project 622401 Structures for increased integration between airframe, flight control, propulsion, electrical, power and thermal management.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>Title:</b> Aircraft Service Life Technologies</p> <p><b>Description:</b> Develop an economic service life analysis capability comprised of analysis tools, methodologies, and structural health monitoring technologies.</p> <p><b>FY 2024 Plans:</b> Not Applicable</p> <p><b>FY 2025 Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable</p>	1.996	0.000	0.000
<p><b>Title:</b> Vehicle Design Technologies</p> <p><b>Description:</b> Develop methodologies to reduce the cost and time involved from design to full-scale testing of structural concepts and aerospace systems.</p> <p><b>FY 2024 Plans:</b> Continue the development of advanced high fidelity aircraft design tools. Continue the development of new design methods that link vehicle system requirements to mission operation performance. Continue the integration of model-based system engineering methodology with risk-aware aircraft design methods. Initiate the integration of cost, mission effectiveness and affordable manufacturing methods with uncertainty quantification across all performance variables to include risk.</p> <p><b>FY 2025 Plans:</b></p>	17.090	18.137	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 622401 / <i>Structures</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Starting in FY2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622401, Structures, Vehicle Design Technologies effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$18.137 million. Funding decreased due to transfer of Vehicle Design Technologies effort to PE 0602203F, Aerospace Propulsion, Project 622401 Structures, Vehicle Design Technologies effort.</p>				
<p><b>Title:</b> Structural Concepts</p> <p><b>Description:</b> Develop design methods, processes, and lightweight, adaptive, and multifunctional structural concepts to capitalize on new materials, multi-role considerations, and technology integration into aircraft systems.</p> <p><b>FY 2024 Plans:</b> Complete development of innovative structural design methods to dramatically reduce weight and complexity of aircraft structures. Complete the validation of impact damage analysis and methods for advanced fail-safe composite structures applicable to next generation aircraft. Continue new low cost design and manufacturing structural concepts for attritable vehicles. Continue development of low-cost agile manufacturing concepts for structures in support of the development of a next variant of a low cost unmanned aerospace system. Initiate systems engineering assessments for the development of airworthiness certification criteria for advanced airframe structures. Initiate the validation of innovative structural design methods to dramatically reduce weight and complexity of aircraft structures. Initiate the demonstration of the fatigue life of bonded unitized composite structures for the next generation of aircraft</p> <p><b>FY 2025 Plans:</b> - Starting in FY2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622401, Structures, Structural Concepts effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> - FY 2025 decreased compared to FY 2024 by \$24.938 million. Funding decreased due to transfer of Structural Concepts effort to PE 0602203F, Aerospace Propulsion, Project 622401 Structures, Structural Concepts effort.</p>		22.780	24.938	0.000
<p><b>Title:</b> Next Generation Aerodynamic Technologies</p> <p><b>Description:</b> Develop and assess technologies for the next generation of multi-role large aircraft.</p> <p><b>FY 2024 Plans:</b></p>		7.837	7.318	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 622401 / <i>Structures</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Continue the development of advanced high fidelity aerodynamic analysis tools for aircraft conceptual design. Continue assessment of innovative next generation vehicle concepts. Initiate modeling and simulation development for the assessment of fuel and energy use.</p> <p><b>FY 2025 Plans:</b> - Starting in FY2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622401, Structures, Next Generation Aerodynamic Technologies effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$7.318 million. Funding decreased due to transfer of Next Generation Aerodynamic Technologies effort to PE 0602203F, Aerospace Propulsion, Project 622401 Structures, Next Generation Aerodynamic Technologies effort.</p>				
<p><b>Title:</b> Aircraft Integration Technologies</p> <p><b>Description:</b> Develop enabling technologies to allow efficient and effective integration of propulsion, weapons, and subsystems into current and future air vehicles.</p> <p><b>FY 2024 Plans:</b> Complete integrated full flow path demonstration of a medium bypass embedded engine for next generation mobility. Complete development of hybrid electric distributed propulsion vehicle integration designs for next generation vehicle concepts. Continue development of novel kinetic weapons integration technologies for enhanced weapon payload in attritable platforms. Initiate the development of a modeling and simulation approach to the design and integration of embedded propulsion systems.</p> <p><b>FY 2025 Plans:</b> - Starting in FY2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622401, Structures, Aircraft Integration Technologies.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$17.174 million. Funding decreased due to transfer of Aircraft Integration Technologies effort to PE 0602203F, Aerospace Propulsion, Project 622401 Structures, Aircraft Integration Technologies effort.</p>		16.026	17.174	0.000
<b>Accomplishments/Planned Programs Subtotals</b>		65.729	67.567	0.000
		<b>FY 2023</b>	<b>FY 2024</b>	
<b>Congressional Add:</b> Full scale determinant assembly for hypersonic airframe structures		9.809	-	

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 622401 / <i>Structures</i>
--	---	--

	FY 2023	FY 2024
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures.		
<b>Congressional Adds Subtotals</b>	9.809	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602201F / Aerospace Vehicle Technologies				<b>Project (Number/Name)</b> 622403 / Flight Controls and Pilot-Vehicle Interface			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622403: <i>Flight Controls and Pilot-Vehicle Interface</i>	-	37.350	39.916	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops technologies that enable maximum affordable capability from manned, remotely-piloted, and autonomous aerospace vehicles. Advanced control, automation, and autonomy technologies are developed for maximum vehicle performance throughout the flight envelope and simulated in full-scale, surrogate, and virtual environments. Resulting technologies contribute significantly towards the development of reliable autonomous or remotely piloted air vehicles, hypersonic aircraft, and extended-life legacy aircraft.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622403 Flight Controls and Pilot-Vehicle Interface, will be transferred to PE 0602203F, Aerospace Propulsion, Project 622403 Flight Controls and Pilot-Vehicle Interface for increased integration between airframe, flight control, propulsion, electrical, power and thermal management.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Advanced Flight Controls Technologies	8.672	9.478	0.000
<b>Description:</b> Develop technologies for advanced control-enabled capabilities, including flight controls, components, integrated vehicle management systems, and software and system certification techniques for both manned/unmanned and remotely piloted aircraft.			
<b>FY 2024 Plans:</b> Continue the development of a trusted autonomy approach, integrating certification processes and autonomy development. Continue the development, demonstration and assessment of autonomy capabilities for dynamic tasking in complex environments. Initiate the development of autonomy optimization and assurance in dynamic and uncertain environments.			
<b>FY 2025 Plans:</b> - Starting in FY2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622403, Flight Controls and Pilot-Vehicle Interface, Advanced Flight Controls Technologies effort.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$9.478 million. Funding decreased due to transfer of Advanced Flight Controls Technologies effort to PE 0602203F, Aerospace Propulsion, Project 622403, Flight Controls and Pilot-Vehicle Interface, Advanced Flight Controls Technologies effort.			
<b>Title:</b> Manned and Unmanned Teaming Technologies	22.166	23.144	0.000



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 622403 / <i>Flight Controls and Pilot-Vehicle Interface</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>Description:</b> Develop technology for flight control systems that will permit safe interoperability between manned and remotely piloted aircraft and effective teaming in adverse and contested environments.</p> <p><b>FY 2024 Plans:</b> Continue the development of tactical autonomy for manned-unmanned teams in contested, dynamic mission environments. Continue the development of mission management autonomy for manned-unmanned teams. Continue the development, demonstration and assessment of autonomous behaviors to address mission capability gaps, such as operations of unmanned systems in terminal environments.</p> <p><b>FY 2025 Plans:</b> - Starting in FY2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622403, Flight Controls and Pilot-Vehicle Interface, Manned and Unmanned Teaming Technologies effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> - FY 2025 decreased compared to FY 2024 by \$23.144 million. Funding decreased due to transfer of Manned and Unmanned Teaming Technologies effort to PE 0602203F, Aerospace Propulsion, Project 622403, Flight Controls and Pilot-Vehicle Interface, Manned and Unmanned Teaming Technologies effort.</p>			
<p><b>Title:</b> Flight Controls Technologies Modeling and Simulation</p> <p><b>Description:</b> Develop tools and methods for capitalizing on simulation-based research and development of future aerospace vehicles.</p> <p><b>FY 2024 Plans:</b> Continue trade studies of vehicle concepts for strike, mobility and reconnaissance. Continue manned-unmanned teaming evaluations including rapid development of new integrated capabilities. Continue analyses of capability concepts for future advanced development programs. Continue modeling and simulation efforts to assess emerging aerospace technologies and concepts in complex and dynamic battlespace environments. Continue digital engineering efforts to create a digital continuum of military utility and cost effectiveness analysis for investment planning to technology development to technology transition.</p> <p><b>FY 2025 Plans:</b> - Starting in FY2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622403, Flight Controls and Pilot-Vehicle Interface, Flight Controls Technologies Modeling and Simulation effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	6.512	7.294	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 622403 / <i>Flight Controls and Pilot-Vehicle Interface</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 decreased compared to FY 2024 by \$7.294 million. Funding decreased due to transfer of Flight Controls Technologies Modeling and Simulation effort to PE 0602203F, Aerospace Propulsion, Project 622403, Flight Controls and Pilot-Vehicle Interface, Flight Controls Technologies Modeling and Simulation effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	37.350	39.916	0.000

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 622404 / <i>Aeromechanics</i>
--	---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
622404: <i>Aeromechanics</i>	-	9.233	10.135	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops aerodynamic configurations of a broad range of revolutionary, affordable aerospace vehicles. It matures and applies modeling and numerical simulation methods for fast and affordable aerodynamics prediction and integrates and demonstrates multi-disciplinary advances in airframe, propulsion, weapon, and air vehicle control integration.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622404 Aeromechanics, is transferred to PE 0602203F, Aerospace Propulsion, Project 622401 Structures for increased integration between airframe, flight control, propulsion, electrical, power and thermal management.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<b>Title:</b> Aerodynamic Systems Technologies	9.233	10.135	0.000
<b>Description:</b> Develop aerodynamic assessment prediction methods centered on expanding the design capabilities of future air vehicles.			
<b>FY 2024 Plans:</b> Complete design assessments of distributed propulsion concepts for next generation aircraft. Continue the assessment and development of incorporating active flow control techniques into advanced design to enable new aircraft configurations. Continue design assessments of long-endurance unmanned platforms. Continue the development of prediction methods which include air vehicle stability and control requirements.			
<b>FY 2025 Plans:</b> Starting in FY2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622401, Structures, Aerodynamic Systems Technologies effort in order to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies effort.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$10.135 million. Funding decreased due to transfer of Aerodynamic Systems Technologies effort to PE 0602203F, Aerospace Propulsion, Project 622401, Structures, Aerodynamic Systems Technologies effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	9.233	10.135	0.000

**C. Other Program Funding Summary (\$ in Millions)**

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602201F / Aerospace Vehicle Technologies	Project (Number/Name) 622404 / Aeromechanics

**C. Other Program Funding Summary (\$ in Millions)**

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602201F / Aerospace Vehicle Technologies				<b>Project (Number/Name)</b> 622405 / High Speed Systems Technology			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622405: High Speed Systems Technology	-	62.938	40.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This effort investigates, analyzes, and develops high speed/hypersonic aerospace vehicle technologies. Advanced high temperature structures concepts are explored and developed to exploit new materials, fabrication processes, and design techniques. Advanced aerodynamic vehicle configurations are developed and analyzed through simulations, experiments, and multi-disciplinary analyses. Advanced subsystem, integration and analysis technologies are developed and simulated for hypersonic vehicles. These technologies will enable future high speed weapons and platforms; intelligence, surveillance, and reconnaissance systems; and space access vehicles.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622405 High Speed Systems Technology, is transferred to PE 0602203F, Aerospace Propulsion, Project 622405 High Speed Systems Technology for increased integration between airframe, flight control, propulsion, electrical, power and thermal management.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> High Speed Systems Technology	19.692	23.240	0.000
<b>Description:</b> Develop design analysis methods and technologies for high speed systems at extreme flight conditions.			
<b>FY 2024 Plans:</b> Continue critical technology maturation for high speed/ hypersonic systems with primary emphasis on longer range flight and heavier payloads. Continue maturation of innovative aerospace structural concepts, analytical methods, service life predictions, airframe/engine integration, fluid/thermal/structural interactions and thermal management techniques. Continue development of high speed system concepts, including flight research concepts, to provide revolutionary capabilities for affordable expendable systems and robust reusable systems. Continue efforts to characterize high-speed vehicle system phenomena, develop and validate fundamental high-speed component technologies through computational analysis, ground, and flight testing.			
<b>FY 2025 Plans:</b> - Starting in FY 2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622405, High Speed Systems Technology, High Speed Systems Technology effort.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024	
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 622405 / <i>High Speed Systems Technology</i>	
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>
FY 2025 decreased compared to FY 2024 by \$23.240 million. Funding decreased due to transfer of High Speed Systems Technology effort to PE 0602203F, Aerospace Propulsion, Project 622405, High Speed Systems Technology, High Speed Systems Technology effort.			
<b>Title:</b> High Speed Vehicle Aeromechanics and Integration		13.819	16.786
<b>Description:</b> Develop new and improved components, concepts, and designs for sustained flight of high-speed/hypersonic expendable and re-useable vehicles. Conduct analyses of high speed/hypersonic vehicles to enable revolutionary capabilities.			0.000
<b>FY 2024 Plans:</b> Continue to mature critical technologies for high speed/hypersonic flight with primary emphasis on longer range and heavier payloads, with secondary emphasis on reusable systems. Continue development of multi disciplinary design and analysis techniques and tools. Continue development of high speed system concepts that provide revolutionary capabilities through configuration research. Continue investigation of aeromechanic technologies to evaluate uncertainty, improve instrumentation accuracy and safe multi-body physics; Complete initial investigation of aeromechanic technologies to reduce drag and achieve robust stability & control at all flight conditions. Continue efforts to characterize high-speed aeromechanics phenomena and develop and validate fundamental high-speed component technologies through computational analysis, ground, and flight testing. Initiate investigation of advanced aeromechanic technologies to extend system range through improvement of system lift/drag ratio and maintain robust stability and control at all flight conditions. Initiate investigation of computational and ground based experimental approaches to improved air induction systems over a wide range of flight conditions.			
<b>FY 2025 Plans:</b> - Starting in FY2025, this work will be performed under PE 0602203F, Aerospace Propulsion, Project 622405, High Speed Systems Technology, High Speed Vehicle Aeromechanics and Integration.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$16.786 million. Funding decreased due to transfer of High Speed Vehicle Aeromechanics and Integration effort to PE 0602203F, Aerospace Propulsion, Project 622405, High Speed Systems Technology, High Speed Vehicle Aeromechanics and Integration effort.			
<b>Accomplishments/Planned Programs Subtotals</b>		33.511	40.026
		0.000	
		<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Program increase - educational agreement partnership for aerospace engineering security integration		9.809	-

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 622405 / <i>High Speed Systems Technology</i>

	FY 2023	FY 2024
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies.		
<b>Congressional Add:</b> Program increase: educational partnership agreement for secure UAV technologies	9.809	-
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology.		
<b>Congressional Add:</b> Program increase: collaborative hypersonic demonstration	9.809	-
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology.		
<b>Congressional Adds Subtotals</b>	29.427	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 625172 / <i>NUCLEAR SYSTEM TECHNOLOGY</i>
--	---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
625172: <i>NUCLEAR SYSTEM TECHNOLOGY</i>	-	3.348	3.624	5.235	0.000	5.235	4.958	5.061	5.219	5.328	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project provides sustaining S&T to preserve nuclear deterrence for future generations, develops complimentary projects to inform future systems, establishing inter-agency partnerships for Modeling & Simulation (M&S) and test platforms, and coordinates with existing programs for next generation strategic systems development and test platforms.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<p><b>Title:</b> Nuclear Technologies</p> <p><b>Description:</b> Develop nuclear-related technologies to support National requirements for nuclear deterrence operations including environmental modeling and simulation on re-entry systems.</p> <p><b>FY 2024 Plans:</b> Initiate development of nuclear re-entry systems modeling and simulation coordinated with PE 0603273F. Continue development and testing of advanced numerical methods for implementation of dynamic techniques for improved event discrimination and characterization for local and regional seismic events. Continue developing earth models and statistical approaches to the behavior of discriminants for local and regional seismic events. Continue model and algorithm development and testing of detection techniques to advance the ground-based seismic nuclear monitoring mission through improved anomaly detection, attribution, and protection. Continue enhanced seismic monitoring with distributed acoustic sensing with machine learning data analysis approach to analyze geometries for noise reduction. Initiate new advanced waveform tomography with 3D source simulations, linear wave propagation simulations and earth structure models to enhance prediction capabilities.</p> <p>Continue aerothermal model validation and development through various testing mechanisms to include the development of integrated end-to-end physics-based modeling suite to predict aerodynamic flow fields, signatures, and material characterizations. Continue to improve modeling fidelity of plasma chemistry through machine learning models for product state distributions. Continue analysis of strategic command, control, and communications to identify space-layer technologies of interest.</p> <p><b>FY 2025 Plans:</b> - Continue development of nuclear re-entry systems M&amp;S coordinated with efforts in PE 0603273F. - Continue development and testing of advanced numerical methods for implementation of dynamic techniques for improved event discrimination and characterization for local and regional seismic events.</p>	3.348	3.624	5.235



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / <i>Aerospace Vehicle Technologies</i>	<b>Project (Number/Name)</b> 625172 / <i>NUCLEAR SYSTEM TECHNOLOGY</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue developing earth models and statistical approaches to the behavior of discriminants for local and regional seismic events.</li> <li>- Continue model and algorithm development and testing of detection techniques to advance the ground-based seismic nuclear monitoring mission through improved anomaly detection, attribution, and protection.</li> <li>- Continue enhanced seismic monitoring with distributed acoustic sensing with machine learning data analysis approach to analyze geometries for noise reduction.</li> <li>- Continue advanced waveform tomography with 3D source simulations, linear wave propagation simulations and earth structure models to enhance prediction capabilities.</li> <li>- Continue aerothermal model validation and development through various testing mechanisms to include the development of integrated end-to-end physics-based modeling suite to predict aerodynamic flow fields, signatures, and material characterizations.</li> <li>- Continue to improve modeling fidelity of plasma chemistry through machine learning models for product state distributions.</li> <li>- Continue advanced development of modeling and simulation tools used in predicting the physics-based effects that result in leading edge shape change of hypersonic vehicles. Initiate weather effects testing on reentry vehicles to gather data for validating current modeling and simulation tools, and for generating new algorithms used for predicting how a reentry vehicle reacts to harsh weather in low atmosphere.</li> <li>- Continue analysis of strategic command, control, and communications to identify space-layer technologies of interest.</li> <li>- Continue development of test and integration plans for hypersonic reentry flight testing of government payloads</li> <li>- Initiate prototype flight test of government technology payload to inform creation of government testbed in coordination with efforts in PE 0603273F.</li> <li>- Continue development of hypersonic technology payloads, to include inertial sensors, mm-Wave communications, spectral and hyperspectral sensors, and heatshield materials, to mature during flight test activities.</li> <li>- Initiate validation of M&amp;S results of hypersonic aerothermal chemistry and shock-layer behavior with experimental flight test data.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 increased compared to FY 2024 by \$1.611 million due to increase in experimentation and integration activities related to development of government flight test bed to support Government Reference Design and nuclear system Science and Technology activities.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	3.348	3.624	5.235

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602201F / Aerospace Vehicle Technologies	<b>Project (Number/Name)</b> 625172 / NUCLEAR SYSTEM TECHNOLOGY
--	--	--

**C. Other Program Funding Summary (\$ in Millions)**

<u>Line Item</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u> <u>Base</u>	<u>FY 2025</u> <u>OCO</u>	<u>FY 2025</u> <u>Total</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>FY 2028</u>	<u>FY 2029</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• RDTE 03 0603273F: <i>Science &amp; Technology for Nuclear Re-entry Systems</i>	39.431	70.162	87.945	-	87.945	118.933	155.791	161.244	-	Continuing	Continuing

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	0.000	133.233	146.921	138.204	0.000	138.204	128.433	127.050	137.461	140.303	Continuing	Continuing
620200: <i>Enterprise Transformational Appld Research</i>	0.000	0.000	0.191	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
621123: <i>Learning and Operational Readiness</i>	0.000	18.632	22.394	20.103	0.000	20.103	21.712	21.588	23.937	24.449	Continuing	Continuing
625328: <i>Biosciences Performance</i>	0.000	38.444	32.218	29.087	0.000	29.087	33.360	30.879	30.828	31.517	Continuing	Continuing
625329: <i>Warfighter Interfaces and Teaming</i>	0.000	35.346	44.454	42.884	0.000	42.884	43.981	44.533	49.415	50.391	Continuing	Continuing
627757: <i>Bioeffects</i>	0.000	40.811	47.664	46.130	0.000	46.130	29.380	30.050	33.281	33.946	Continuing	Continuing

**Note**

This program, BA 2, PE 0602202F, project 621123, Learning and Operational Training, is a new start.  
 This program, BA 2, PE 0602202F, project 621123, Digital Models of Cognition, is a new start.  
 This program, BA 2, PE 0602202F, project 625329, Human Machine Interactions, is a new start.  
 This program, BA 2, PE 0602202F, project 625329, Distributed Teaming and Communication, is a new start.

**A. Mission Description and Budget Item Justification**

This program conducts applied research in the area of airmen training, airmen performance sustainment, bioeffects, and understanding and shaping adversarial behavior. The Learning and Operational Readiness project conducts research to increase the agility of training for readiness while advancing learning and performance assessment science and practice. The Biosciences Performance project conducts research to discover, demonstrate, and transition capabilities which optimize and safe-guard Airman physical and cognitive performance allowing for the maximum potential of the multi-domain Airman. The Warfighter Interfaces and Teaming project conducts research to discover, develop, and transition advanced interface technology, decision aiding tools, and situationally-adaptive augmentation methods to seamlessly integrate Airmen and intelligent machines into maximally collaborative warfighting teams. The Bioeffects project conducts novel and operational exposure bioeffects research, exposure effects analysis and national/international exposure standards for the Air Force to enable, sustain, and enhance Airman performance and protection during deployment of directed energy systems.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>
---	---

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 program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	150.771	146.921	141.651	0.000	141.651
Current President's Budget	133.233	146.921	138.204	0.000	138.204
Total Adjustments	-17.538	0.000	-3.447	0.000	-3.447
• 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	-9.633	0.000			
• SBIR/STTR Transfer	-2.474	0.000			
• Other Adjustments	-5.431	0.000	-3.447	0.000	-3.447

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 625328: *Biosciences Performance*

Congressional Add: *Critical Air Transport Technology Expansion*

Congressional Add: *Advanced Warfighter Physiology and Operational Readiness*

Congressional Add: *Special Tactics Support Assessment*

Congressional Add Subtotals for Project: 625328

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	0.000	0.000
	4.000	0.000
	4.000	0.000
Congressional Add Subtotals for Project: 625328	8.000	0.000
Congressional Add Totals for all Projects	8.000	0.000

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / Human Effectiveness Applied Research	<b>Project (Number/Name)</b> 620200 / Enterprise Transformational Applied Research
--	--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
620200: Enterprise Transformational Applied Research	0.000	0.000	0.191	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program element develops multidisciplinary applied research efforts to accelerate the technology pipeline of transformational capabilities by reducing risk and maturing the technology so it can transition in support of larger advanced technology development capability investments. These activities are selected to enable solutions to the DAFs highest priorities to include Operational Imperatives and Critical Technology Areas. The Explore effort engages traditional & nontraditional industry, government laboratories and academia through 12-24 month feasibility studies and demonstrations. The Seedlings for Disruptive Capabilities Program (SDCP) facilitates AFRL cross-disciplinary applied research to provide leap-ahead, high risk technology development. Modeling, simulation, and analyses activities will continue to explore transformational research analytic technologies to enable validated positions and provide a solid foundation with emphasis to predict future outcomes and technology needs, as well as looking for more seedlings to feed the transformational capability pipeline. Continue to advance future workforce development programs and broadening partnerships to deepen and expand the scientific and technology enterprise. Applied research efforts span a broad spectrum of activities, and established processes allow agility and flexibility to meet higher demand signals.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<b>Title:</b> Enterprise Transformational Applied Research	0.000	0.191	0.000
<b>Description:</b> Enterprise Transformational Applied Research			
<b>FY 2024 Plans:</b> This work will be executed out of and described in the plans for Program PE 0602202F Enterprise Transformational Applied Research, Project 620200 Enterprise Transformational Applied Research effort.			
<b>FY 2025 Plans:</b> This work moved and is executed out of and described in the plans for Program PE 0602202F Enterprise Transformational Applied Research, Project 620200 Enterprise Transformational Applied Research effort.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased from FY 2024 by \$0.191 million. This work moved and is executed out of and described in the plans for Program PE 0602202F Enterprise Transformational Applied Research, Project 620200 Enterprise Transformational Applied Research effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.191	0.000

UNCLASSIFIED

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 620200 / <i>Enterprise Transformational Applied Research</i>

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 621123 / <i>Learning and Operational Readiness</i>
--	---	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
621123: <i>Learning and Operational Readiness</i>	0.000	18.632	22.394	20.103	0.000	20.103	21.712	21.588	23.937	24.449	Continuing	Continuing

**Note**  
 This program, BA 2, PE 0602202F, project 621123, Learning and Operational Training, is a new start.  
 This program, BA 2, PE 0602202F, project 621123, Digital Models of Cognition, is a new start.

**A. Mission Description and Budget Item Justification**

This project enables decision superiority by advancing the science and technology of human multisensory perception, learning, information processing, and action. This project looks to establish a persistent, global experimentation, test, and training ecosystem that supports personalized, proficiency-based readiness for warfighters in joint all-domain operations. Using digital modeling advancements will be made with consideration of human perception, cognition, and action in system development, wargaming, and operational planning. Research is conducted in two focus areas: learning and operational training and digital models of cognition. Digital models of cognition focus on holistic models that support quantitative understanding and prediction of mission effectiveness. Learning and operational training improves learning and understanding in the context of evolving technology.

**B. Accomplishments/Planned Programs (\$ in Millions)**

<b>Title:</b> Personalized Learning	FY 2023	FY 2024	FY 2025
<p><b>Description:</b> Research lays the foundation for long-term Operational Training and Test Infrastructure by creating capabilities that enhance live-virtual-constructive environment and integration, exploring environments and mechanisms to enable collaborative learning in human-machine teams, researching individual and team measurement and assessment techniques, algorithms to enable a shift toward personalized and proficiency-based training and readiness management, and researching how advanced learning technologies like augmented and virtual reality can be used to increase the effectiveness and efficiency of training.</p> <p><b>FY 2024 Plans:</b>                      Continue research evaluating integrated human and machine personalized learning capabilities in mission-relevant laboratory. Initiate research integrating multi-objective optimization and team proficiency assessment into a common ecosystem for synthetic operational training and testing. Initiate transition of proficiency measurement and prediction capabilities, including uncertainty quantification, to targeted domains such as language learning and recurring training areas. Continue research evaluating the impact of training fidelity related to augmented, virtual, mixed, and extended reality on readiness. Continue exploring methods and standards for assessing transfer of skill for just in time, novel mission training requirements for a peer fight in deployed and austere environments. Initiate mobile research platform for embedding in integrated training events for data collection</p>	11.432	13.436	4.666

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 621123 / <i>Learning and Operational Readiness</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>in controlled, naturalistic environment. Initiate mechanisms for co-learning in teams of humans and machines to maximize collaboration and performance in a laboratory setting.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue research evaluating integrated human and machine personalized learning capabilities in mission-relevant laboratory.</li> <li>- Continue research integrating multi-objective optimization and team proficiency assessment into a common ecosystem for synthetic operational training and testing.</li> <li>- Complete transition of proficiency measurement and prediction capabilities, including uncertainty quantification, to targeted domains such as language learning and recurring training areas.</li> <li>- Continue research evaluating the impact of training fidelity related to augmented, virtual, mixed, and extended reality on readiness.</li> <li>- Complete exploring methods and standards for assessing transfer of skill for just in time, novel mission training requirements for a peer fight in deployed and austere environments.</li> <li>- Complete mobile research platform for embedding in integrated training events for data collection in controlled, naturalistic environment.</li> <li>- Continue mechanisms for co-learning in teams of humans and machines to maximize collaboration and performance in a laboratory setting.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased from FY 2024 by \$8.770 million. Funding decrease due to a reduced emphasis in proficiency measurement and prediction capabilities, transfer of skill in mission training, and mobile research platforms for integrated training events.</p>				
<p><b>Title:</b> Learning and Operational Training</p> <p><b>Description:</b> Research that emphasizes learning and understanding in the context of evolving technology. This includes research to establish an ecosystem that maximizes mission effectiveness while minimizing costs by matching technologies to learning and performance needs; targeted investments to develop, demonstrate, and transition learning methods and technologies matched to learner and performance needs; high resolution human and system measurement to enable quantitative, proficiency-centric readiness assessment and prediction at the individual and team levels; and exploration of mechanisms and theory of interactive learning and collaborative training of humans and Artificial Intelligence-enabled machines to support mutual adaptation and understanding that fosters uniquely effective human-autonomy teams.</p> <p><b>FY 2024 Plans:</b> Not Applicable</p> <p><b>FY 2025 Plans:</b></p>		0.000	0.000	7.554



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 621123 / <i>Learning and Operational Readiness</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Initiate research on how to apply theories, methods, and studies to support just in time training to accelerate the acquisition of expertise and increase performance resilience.</li> <li>- Initiate definition data tools, analytics, schemes, and Models to enable training and readiness representations for digital engineering.</li> <li>- Initiate exploration and assessment of infrastructure needs to support training for a peer fight that enables the collection, contextualization, and application of data for performance assessment, readiness management, and personalization of competency-based instruction.</li> <li>- Initiate defining the methods and technologies to support the interactive learning between humans and AI-enabled technologies.</li> <li>- Initiate exploration and validation of adaptive team training paradigms with relevant test and evaluation approaches to ensure uniquely effective human-autonomy teams.</li> <li>- Initiate identification and validation of algorithms to shape flexible, adaptive, shared representations between teammates.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$7.554 million. Funding increase due to added emphasis in a new thrust area for adaptive team training paradigms to ensure uniquely effective human-autonomy teams, and the identification and validation of algorithms for teaming.</p>			
<p><b>Title:</b> Cognitive Modeling</p> <p><b>Description:</b> Research explores application of mathematical and computational modeling to understand the human mind and factors that will enhance or degrade cognitive performance. Capabilities enable personalized learning by tracking individual learning and targeting training interventions where/when needed. Research also explores applications for computer-generated forces with greater cognitive fidelity improving realism while reducing manpower costs for large, simulated scenarios. Investigates algorithms that track and predict readiness and mission effectiveness based on influences of the mission context and individual stressors improving the fidelity of wargames, system development, and operational planning with better characterizations of human capital capacities and limitations.</p> <p><b>FY 2024 Plans:</b> Initiate capability for real-time fatigue monitoring and prediction for mobility and maintainer community. Continue real-time, personalized tracking of fatigue in operationally relevant environments, including impacts of countermeasures. Complete integrated physiology cognitive models to oxygen deprivation and chemical air contaminants. Continue laboratory capability profile workload and cognitive performance in real-time, and assess and predict performance based on interacting effects of multiple cognitive modulators in a laboratory setting. Initiate research computational and mathematical frameworks for representing human performance across scales of analysis, components of cognition and performance, and levels of resolution for digital engineering applications. Initiate computational modeling capability for situational understanding through natural language interaction,</p>	7.200	8.958	3.119

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 621123 / <i>Learning and Operational Readiness</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>information extraction, and information seeking in a laboratory context. Initiate research to demonstrate autonomy-based dynamic task allocation based on operator workload with context sensitivity.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete capability for real-time fatigue monitoring and prediction for mobility and maintainer community.</li> <li>- Complete real-time, personalized tracking of fatigue in operationally relevant environments, including impacts of countermeasures.</li> <li>- Complete laboratory capability profile workload and cognitive performance in real-time, and assess and predict performance based on interacting effects of multiple cognitive modulators in a laboratory setting.</li> <li>- Continue research computational and mathematical frameworks for representing human performance across scales of analysis, components of cognition and performance, and levels of resolution for digital engineering applications.</li> <li>- Continue computational modeling capability for situational understanding through natural language interaction, information extraction, and information seeking in a laboratory context.</li> <li>- Continue research to demonstrate autonomy-based dynamic task allocation based on operator workload with context sensitivity.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$5.839 million. Funding decrease due to a reduced emphasis in real-time fatigue monitoring, personalized fatigue tracking, and workload and cognitive performance predictions from multiple cognitive modulators.</p>				
<p><b>Title:</b> Digital Models of Cognition</p> <p><b>Description:</b> Research to identify computational and mathematical mechanisms to represent human perception, information processing, and behavior, including the integration of models that reflect the role of internal and external factors that modulate performance efficiency and effectiveness. Research area develops models of cognitive systems that support quantitative understanding and prediction of mission effectiveness for decision superiority. Develops analytic methods, models, and tradecraft that enables operators to improve Information-Related Capability.</p> <p><b>FY 2024 Plans:</b> Not Applicable</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Initiate computational cognitive modeling to enable quantitative understanding and prediction of mission effectiveness in the context of controlling crewed aircraft and Collaborative Combat Aircraft within the Next Generation Air Dominance family of systems for decision superiority.</li> <li>- Initiate experimentation on digital models that account for internal and external factors that modulate cognitive performance efficiency and effectiveness within tactical environments.</li> </ul>		0.000	0.000	4.764

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 621123 / <i>Learning and Operational Readiness</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Initiate research to define descriptive and anticipatory analytics that derive from network and content data to inform assessment and decision making re: information maneuvers and strategies.</li> <li>- Initiate experimentation to examine the underlying psychological mechanisms of influence and test methods to build resilience.</li> <li>- Initiate research to create digital models to examine different social dynamics and features that impact individual and group cognition.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 increased compared to FY 2024 by \$4.764 million. Funding increase due to added emphasis in a new thrust area for psychological mechanisms of influence and test methods to build resilience, and digital models to examine different social dynamics and features that impact individual and group cognition.</p>				
<b>Accomplishments/Planned Programs Subtotals</b>		18.632	22.394	20.103
<b>C. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				
None				
<b>D. Acquisition Strategy</b>				
Not Applicable				

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>				<b>Project (Number/Name)</b> 625328 / <i>Biosciences Performance</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
625328: <i>Biosciences Performance</i>	0.000	38.444	32.218	29.087	0.000	29.087	33.360	30.879	30.828	31.517	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project conducts bioengineering and biotechnology research to optimize, safe-guard, and restore the performance of the multi-domain Airman in all environments. Research is focused in the areas of 1) Applied Cognitive Neurosciences: technologies to sustain, augment, and recover operator performance; 2) Biotechnology for performance: research in systems biology, synthetic biology, and risk assessment; 3) Performance sensing and assessment: technologies to sense and forecast operator state based on physiological, molecular, and environmental signatures related to mission performance; and 4) Performance impact of flight: elucidate how air environments affect processes of life and the ability to maintain physiological equilibrium and develop countermeasures and solutions to sustain, enhance, and restore operator performance.

In FY 2025 Project 625328 Biosciences Performance, changed from Human Dynamics Evaluation.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Performance Sensing and Assessment	7.611	6.444	5.675
<b>Description:</b> Develop technologies to sense and forecast operator state based on physiological, molecular, and environmental signatures related to Airman performance. Develop solutions optimized for real-time, minimally-invasive, and autonomous sensing and assessing capabilities to enhance and protect the Airman across the spectrum of operational environments.			
In FY 2023, this effort changed names from Molecular Sensing and Physiology to Performance Sensing and Assessment.			
<b>FY 2024 Plans:</b> Continue rapid Biological Recognition Element selection and optimization strategies. Continue electrochemical and Field Effect Transistors-based biomarker sensing platforms, including synthetic biology developed components. Complete sensor form factor for deployment with focus on platform miniaturization. Complete wearable and implantable/biodegradable sensors for continuous biomarker monitoring. Complete platforms to deliver augmentation strategies in an autonomous fashion. Complete the evaluation of commercial, off-the-shelf molecular-based sensing technologies for Air Force and Space Force applications. Initiate the identification and optimize bio-molecular mechanisms to sense cognitive function, performance, fatigue, and stress in console operators (i.e. Intelligence, Surveillance, Reconnaissance; Cyber; Space). Initiate data analytics based on sensor output to assess operator cognitive status, and facilitate decision making. Initiate integrating sensing and intervention mechanisms to sustain and augment operator performance. Utilize these sensors and intervention inputs/outputs to optimize human-machine learning.			
<b>FY 2025 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 625328 / <i>Biosciences Performance</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue rapid Biological Recognition Element selection and optimization strategies.</li> <li>- Continue electrochemical and Field Effect Transistors-based biomarker sensing platforms, including synthetic biology developed components.</li> <li>- Continue optimizing synthetic biology capabilities to deliver biochemical interventions.</li> <li>- Continue the identification and optimize bio-molecular mechanisms to sense cognitive function, performance, fatigue, and stress in console operators (i.e. Intelligence, Surveillance, Reconnaissance; Cyber).</li> <li>- Continue data analytics based on sensor output to assess operator cognitive status, and facilitate decision making.</li> <li>- Continue integrating sensing and intervention mechanisms to sustain and augment operator performance.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.769 million. Funding decreased due to Air Force funding re-prioritization.</p>			
<p><b>Title:</b> Biotechnology for Performance</p> <p><b>Description:</b> Conduct research in systems biology, synthetic biology, and physiologic risk assessment research to focus on the underlying mechanisms contributing to individual performance in various operational environments through the integration of multiple genetic and biomarker technologies. Conduct research to utilize biomarker technologies to determine the risk associated with exposure to toxic compounds and materials. Resulting research will generate biomarker candidates for sensing personalized predictions of response to stressors and novel interventions to optimize, safeguard, and restore Airman performance.</p> <p>In FY 2023, this effort changed names from Systems Biology for Performance to Biotechnology for Performance.</p> <p><b>FY 2024 Plans:</b> Complete a microfluidic "brain-on-a-chip" platform simulating the dynamic environment and physiologic conditions of brain cells/ tissue to include blood brain barrier oxygen dynamics. Continue utilizing advanced bio-data analytics and bioinformatics processing to analyze, and leverage these comprehensive baseline biomarker validation in a large-scale cohort developing Airman-specific predictive algorithms for physical/cognitive state, as well as personalized sustainment/augmentation strategies utilizing advanced bio-data analytics and bioinformatics processing. These relevant biomarkers will be used to generate optimal targets for sensor development for personalized state assessment enabling real-time feedback and performance optimization. Complete the identification of a nasal microbiome strain suitable for improved stress resilience.</p> <p><b>FY 2025 Plans:</b> - Continue utilizing advanced bio-data analytics and bioinformatics processing to analyze biological mechanisms in Airmen, leveraging comprehensive baseline biomarker validation in a large-scale cohort to develop Airman-specific predictive algorithms for physical/cognitive state, as well as personalized sustainment/augmentation strategies utilizing advanced bio-data analytics and bioinformatics processing. These relevant biomarkers will be used to generate optimal targets for sensor development</p>	7.611	6.444	5.675

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 625328 / <i>Biosciences Performance</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>for personalized state assessment enabling real-time feedback and performance optimization, as well as inform human digital engineering efforts.</p> <ul style="list-style-type: none"> <li>- Initiate the advancement of microfluidic "organ-on-a-chip" platforms to interrogate the interactions between multi-organ systems, through simulation of the dynamic environment and physiologic conditions of tissues.</li> <li>- Initiate validation trials of an engineered probiotic designed to mitigate cognitive fatigue and enhance airman performance.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.769 million. Funding decreased due to Air Force funding re-prioritization.</p>			
<p><b>Title:</b> Applied Cognitive Neurosciences</p> <p><b>Description:</b> Develop technologies in cognitive neuroscience and physical performance to sustain, augment, and recover operator performance and determine performance attributes/metrics for optimal career field alignment. Includes research focused on developing and validating physiological and behavioral assessments of current and predicted cognitive state combined with personalized cognitive performance enhancement techniques and technologies to augment operator performance.</p> <p>In FY 2025, this effort changed names from Cognitive and Physiological Performance to Applied Cognitive Neurosciences.</p> <p><b>FY 2024 Plans:</b> Continue evaluating brain machine interface technology applications that enhance human machine teaming performance. Continue maturing existing brain machine interfaces, neurotechnology, and advanced algorithms towards a candidate product capable of monitoring brain state, and applying non-invasive interventions that accelerate training and enhance skill retention. Initiate modeling for neural and physiological patterns associated with decision making, and evaluate neuromodulation approaches for inducing an optimal decision making state. Complete transition of neuromodulation technologies for mature devices and applications (e.g. accelerated training of image analysts) while simultaneously exploring and maturing neuromodulation technology (e.g. focused ultrasound and magnetic devices) paradigms for new cognitive enhancement/sustainment applications. Continue real-time analytics testbed with additional capabilities and utilize for cognitive probing validation and replication experiments.</p> <p><b>FY 2025 Plans:</b> - Continue evaluating brain machine interface technology applications that enhance human machine teaming performance. - Continue developing algorithms to assess the cognitive state of the Airman via passive brain-computer interface for real-time assessment of workload, attention, and uncertainty. - Continue constructing methods to communicate these states to Artificial Intelligence-enabled technology to provide superior human-machine teaming/interaction (outcomes of decisions made by human-machine teams are optimized when the machine understands the moment-to-moment cognitive of their human teammate).</p>	7.611	16.109	14.521

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 625328 / <i>Biosciences Performance</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue modeling neural and physiological patterns associated with superior decision-making and evaluate neuromodulation approaches for inducing an optimal decision-making state.</li> <li>- Initiate evaluating the effects of neuromodulation technologies on brain activity using advanced neuroimaging techniques.</li> <li>- Initiate neuromodulation paradigms with new technologies (e.g. peripheral nerve stimulation, focused ultrasound stimulation, and photo-biomodulation) for cognitive enhancement across Air Force career fields (i.e., piloting; intelligence, surveillance, and reconnaissance; cyber operations; special operations).</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$1.588 million. Funding decreased due to Air Force funding re-prioritization.</p>				
<p><b>Title:</b> Performance Impact of Flight</p> <p><b>Description:</b> Conduct research investigating Airman performance degradation resulting from exposure to air environments, and seek understanding the fundamental mechanisms driving environmental and operational risks. Develop technologies to mitigate or eliminate the root physiologic causes of these degradations and to ultimately optimize Airman performance resulting in the capability to fly faster, higher, and longer than our adversaries.</p> <p>In FY 2025, this effort changed names from Performance Impact of Air and Space to Performance Impact of Flight.</p> <p><b>FY 2024 Plans:</b> Continue applied research for Air Force customers in areas of aircrew injury assessment/mitigation and Onboard Oxygen Generation System operational performance assessment and enhancement. Continue research to characterize aircrew motion, biomechanical sensitivity to aircrew flight equipment and systems, the cause of acute and chronic back/neck pain, and musculoskeletal injuries towards the development of a Multi-Axial Neck Injury Criteria and Lumbar Injury Criteria. Complete mitigation strategies such as physical conditioning, system design improvements, and interventional strategies to repair post-sortie injury from high-G exposures. Continue human digital engineering algorithms and models for fighter and bomber aircraft system design, and human factors analysis applications. Initiate development of air supply pressure stabilization system to mitigate air supply pressure degradations. Initiate investigation into system integration approaches for fighter/trainer/bomber aircraft of onboard oxygen generation systems.</p> <p><b>FY 2025 Plans:</b> - Continue research for Air Force customers in areas of aircrew injury assessment/mitigation and Onboard Oxygen Generation System operational performance assessment and enhancement to eliminate dependence on aircraft environmental control system.</p>		7.611	3.221	3.216

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 625328 / <i>Biosciences Performance</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue research to characterize aircrew motion, biomechanical sensitivity to aircrew flight equipment and systems, the cause of acute and chronic back/neck pain, and musculoskeletal injuries towards the development of a Multi-Axial Neck Injury Criteria and Lumbar Injury Criteria.</li> <li>- Continue developing human digital engineering algorithms and models for fighter and bomber aircraft system design, and human factors analysis applications.</li> <li>- Initiate vetting tech solutions for clinical evaluation of musculoskeletal function and investigating of biomechanical injury mechanisms from aircraft environment.</li> <li>- Initiate digital transformation of data infrastructure for machine learning/Artificial Intelligence-Driven analytics, multi-modal sensing capabilities, and computational modeling.</li> <li>- Initiate development of Next Gen Medical Oxygen Concentrator using ion transport membrane technology to support aeromedical evacuation mission.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.005 million. Justification for this decrease described in plans above.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	30.444	32.218	29.087

	<b>FY 2023</b>	<b>FY 2024</b>
<p><b>Congressional Add:</b> Critical Air Transport Technology Expansion</p> <p><b>FY 2023 Accomplishments:</b> Congressionally directed effort (Critical Air Transport Technology Expansion) was moved to PE 0603456F / Human Effectiveness Advanced Technology Development, BPAC 635324 Biosciences Performance Demonstration for execution.</p> <p><b>FY 2024 Plans:</b> Not Applicable</p>	0.000	0.000
<p><b>Congressional Add:</b> Advanced Warfighter Physiology and Operational Readiness</p> <p><b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts</p> <p><b>FY 2024 Plans:</b> Not Applicable</p>	4.000	0.000
<p><b>Congressional Add:</b> Special Tactics Support Assessment</p> <p><b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts</p> <p><b>FY 2024 Plans:</b> Not Applicable</p>	4.000	0.000
<b>Congressional Adds Subtotals</b>	8.000	0.000



UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602202F / Human Effectiveness Applied Research	Project (Number/Name) 625328 / Biosciences Performance

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / Human Effectiveness Applied Research	<b>Project (Number/Name)</b> 625329 / Warfighter Interfaces and Teaming
--	--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
625329: Warfighter Interfaces and Teaming	0.000	35.346	44.454	42.884	0.000	42.884	43.981	44.533	49.415	50.391	Continuing	Continuing

**Note**

This program, BA 2, PE 0602202F, project 625329, Human Machine Interactions, is a new start.  
 This program, BA 2, PE 0602202F, project 625329, Distributed Teaming and Communication, is a new start.

**A. Mission Description and Budget Item Justification**

This project conducts research to achieve decision superiority across our forces, through research on advanced human-machine interfaces, joint-cognitive systems decision-making, distributed and collaborative teaming and communication enhancements. Research provides advanced warfighter Command and Control interface technology, team collaboration tools, intelligent decision aids, and agile communications management. Research is conducted in two focus areas: human-machine interactions and distributed teaming and communication. Human-machine interactions focuses on achieving decision superiority by optimizing human engagement with increasingly complex, highly automated, and Artificial Intelligence-enabled machines. Distributed teaming and communication research technology and methods to enhance the formation, assessment, and performance of distributed teams of warfighters as well as human-machine teams.

In FY 2025 Project 625329 Warfighter Interfaces and Teaming changed from Sensory Evaluation and Decision Science.

**B. Accomplishments/Planned Programs (\$ in Millions)**

<b>Title:</b> Collaborative Interfaces and Teaming	FY 2023	FY 2024	FY 2025
<b>Description:</b> Research new Human-Machine Teaming technologies and concepts (e.g., information portrayal, control devices, decision aiding algorithms and adaptive agents) for effective human-machine interaction and teamwork.	8.439	12.003	4.286
<b>FY 2024 Plans:</b> Initiate research effort on team resilience; build upon foundation of novel teaming metrics research to develop prototype team health scanner tool. Initiate research on transparency for distributed teams; build upon Joint All Domain Command and Control playbook research to develop prototype support tools for multi-domain teaming. Continue research on human autonomy collaboration tools to enhance resiliency. Complete research on human implications of machine learning and run-time assurance technologies. Complete research focused on development of software architectures and platforms to enable human-machine-teaming for pilot-vehicle interfaces in operationally relevant scenarios, Unmanned Aerial System teaming, base defense, and air battle management. Initiate the exploration of test methods for achieving bi-directional transparency in human-machine teaming. Complete research on trust development within mixed human-synthetic agent teams. Continue transfer of authority research to facilitate rapid acquisition of situation awareness for unexpected custody of assets. Continue research methodologies to conduct operator-centric field evaluations of fielded automation/autonomy systems. Experiment with interface technologies for control of			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 625329 / <i>Warfighter Interfaces and Teaming</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>unmanned assets from aerial platforms. Continue to refine guidelines for engendering trust and/or suspicion in human-human and human-machine teams.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete research effort on team resilience; build upon foundation of novel teaming metrics research to develop prototype team health scanner tool.</li> <li>-Continue research on transparency for distributed teams; build upon Joint All Domain Command and Control playbook research to develop prototype support tools for multi-domain teaming.</li> <li>- Continue research on human autonomy collaboration tools to enhance resiliency.</li> <li>- Continue the exploration of test methods for achieving bi-directional transparency in human-machine teaming.</li> <li>- Complete transfer of authority research to facilitate rapid acquisition of situation awareness for unexpected custody of assets.</li> <li>- Continue research methodologies to conduct operator-centric field evaluations of fielded automation/autonomy systems. Experiment with interface technologies for control of unmanned assets from aerial platforms.</li> <li>- Continue to refine guidelines for engendering trust and/or suspicion in human-human and human-machine teams.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased from FY 2024 by \$7.717 million. Funding decrease due to a reduced emphasis in operator-centric field evaluations, team resilience scanner tools, and transfer of authority research for rapid acquisition of situation awareness.</p>			
<p><b>Title:</b> Multisensory Perceptions and Communication</p> <p><b>Description:</b> Multisensory Perception and Communication focuses on identifying and exploiting the underlying sensory and cognitive mechanisms mediating human perception and communication in order to inform the development of multimodal interfaces and speech/language technologies. Research examines sensory processing, multisensory integration, and human communication processes in simple and complex environments to identify the barriers to effective information transmission and inform the development of technologies to overcome, or exploit, those barriers in order to enhance Airmen performance.</p> <p><b>FY 2024 Plans:</b> Continue behavioral research on issues associated with disrupted and degraded communication channels. Initiate natural ad hoc team coordination in emergency response and Joint-All Domain scenarios. Initiate the collection of communication data from live and simulated events in these domains, and use data to develop new models of natural human communication processes. Continue operationally-relevant speech databases and dialogue processes. Build and integrate algorithms from these new models into novel communication interface prototypes for effective and efficient human-autonomy teaming. Initiate the development of new tools for integrating situation awareness displays with language based communication systems, and evaluate these capabilities in laboratory studies and operationally-relevant testbeds. Complete the evaluation of Augmented and Virtual reality capabilities for providing information through additional perceptual channels (visual, haptic/tactile along with speech</p>	12.855	16.892	8.584

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 625329 / <i>Warfighter Interfaces and Teaming</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>communications) for distributed, collaborative tasks, supporting multi-capable airmen. Complete multimodal symbiologies and evaluate, with subject matter experts from flight community and Special Forces, in simulation and real-world environments with appropriate environmental/task complexity. Complete the collection of behavioral and neurophysiological data, use to refine real-time model of attention and processing capacity, integrate into testbeds to evaluate as driver for adaptive interfaces. Complete the evaluation of new technologies focused on perceptual and communication disruption in field tests.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete behavioral research on issues associated with disrupted and degraded communication channels.</li> <li>- Continue natural ad hoc team coordination in emergency response and Joint-All Domain scenarios.</li> <li>- Continue the collection of communication data from live and simulated events in these domains, and use data to develop new models of natural human communication processes.</li> <li>- Complete operationally-relevant speech databases and dialogue processes.</li> <li>- Continue the development of new tools for integrating situation awareness displays with language based communication systems, and evaluate these capabilities in laboratory studies and operationally-relevant testbeds.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$8.308 million. Funding decrease due to a reduced emphasis in disrupted and degraded communications, speech databases and dialogue processes, and perceptual and communication disruption tests.</p>			
<p><b>Title:</b> Human Machine Interactions</p> <p><b>Description:</b> Research to identify principles of human interaction with highly complex systems, including advanced automation and increasingly intelligent Artificial Intelligence-enabled machines. The goal of this research is to achieve and sustain decision superiority across complex and uncertain mission environments. Research areas include identifying, characterizing, and overcoming key challenges to warfighter interactions with complex and intelligent systems, situationally adaptive interface design and usability, knowledge representation across sensory modalities, system observability and transparency, directability, joint-cognitive decision making, and maintaining properly calibrated trust across changing conditions.</p> <p><b>FY 2024 Plans:</b> Not Applicable</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Initiate research on human-centric interfaces and interaction strategies for improved Artificial Intelligence/automation transparency across different mission applications and Artificial Intelligence methods (including generative Artificial Intelligence approaches).</li> <li>- Initiate research into strategies that optimize closed-loop system adaptations to current operator functional state (i.e., workload) for maximally performing human-machine teams.</li> </ul>	0.000	0.000	11.250

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 625329 / <i>Warfighter Interfaces and Teaming</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Initiate research on advanced visualization techniques to enable warfighters to rapidly extract meaning from complex, uncertain, multi-dimensional data sources.</li> <li>- Initiate research on continuous planning techniques, tradecraft, and interface tools that streamline and strengthen multi-player, AI-enabled plan development, and assessment.</li> <li>- Initiate identification of interface implications of cognitive warfare; tools for improved situation awareness of cognitive warfare threats, better decision-making, and intelligently deploying and directing cognitive warfare related effects.</li> <li>- Initiate research on next generation interfaces for tactically managing next-generation platforms with an emphasis on interface standardization across platforms/missions.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$11.250 million. Funding increase due to added emphasis in a new thrust area for human-centric interfaces and interaction strategies with Artificial Intelligence, system adaptations for operator state to maximize human-machine teams, and decision-making and cognitive warfare related effects.</p>			
<p><b>Title:</b> Distributed Teaming and Communication</p> <p><b>Description:</b> Research that explores the rapid formation, real-time assessment, and dynamically optimized performance of distributed heterogeneous teams of warfighters as well as human-machine teams to enable rapid, agile and robust mission operations. Research areas include methods to enable the rapid formation of mission-effective heterogeneous teams, dynamic monitoring/assessment of team performance through optimal assemblage of novel and existing metrics, adaptive tactics for recovery from real or predicted team performance degradations, and novel distributed communication and collaboration tools, technologies and management methods that are responsive to variable network environments.</p> <p><b>FY 2024 Plans:</b> Not Applicable</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Initiate research and development of novel, nonintrusive metrics, and models to dynamically assess distributed team performance and behavior.</li> <li>- Initiate research into natural language processing methods to improve teamwork assessments and mitigations.</li> <li>- Initiate research on adaptive communication management interfaces that enable resilient multi-mixed teams in Joint All Domain Command and Control operations.</li> <li>- Initiate research on distributed teaming: characteristics, influences, challenges, and collaborative solutions to maximize team situation awareness and dynamic task management.</li> <li>- Initiate research on enhanced conversational Artificial Intelligence to optimize human-automation teaming and enable high-bandwidth interaction with intelligent agents similar to humans.</li> </ul>	0.000	0.000	14.478

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 625329 / <i>Warfighter Interfaces and Teaming</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Initiate research on how best to integrate multi-domain information for rapid warfighter assessment and action in Joint All Domain Command and Control.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$14.478 million. Funding increase due to added emphasis in a new thrust area for the development of metrics and models to assess distributed team performance and behavior, adaptive communication management interfaces, and integration of multi-domain information for rapid warfighter assessment.</p>			
<p><b>Title:</b> System Analytics</p> <p><b>Description:</b> System Analytics studies the macro-cognition of the Airman using computational tools to accomplish mission objectives, encompassing interactions between operators, analytics, and environment. The goal of this research area is to describe, assess, and design for effective integration of analytics into mission systems.</p> <p><b>FY 2024 Plans:</b> Continue the assessing design systems and methods to effectively blend data analytics with human cognition, with the goal of enhancing Airman and Guardian decision-making and improving joint cognitive systems performance in the face of massive volumes of complex and fast-changing information. Initiate assessing and enhancing the impact of analytics on thinking and reasoning in order to tailor capabilities to the context-specific cognitive requirements of our Warfighters. Initiate sensemaking studies, improve situational awareness, and mitigate data overload in order to enable Warfighters to rapidly extract meaning from complex, uncertain, and multi-dimensional data sources. Specific work is being vectored to directly support Joint All-Domain Command and Control, with attention to experiments, studies, guidelines, and publications in high-priority and related strategic investment areas.</p> <p><b>FY 2025 Plans:</b> - Complete the assessing design systems and methods to effectively blend data analytics with human cognition, with the goal of enhancing Airman decision-making and improving joint cognitive systems performance in the face of massive volumes of complex and fast-changing information. - Continue assessing and enhancing the impact of analytics on thinking and reasoning in order to tailor capabilities to the context-specific cognitive requirements of our Warfighters. - Continue sensemaking studies, improve situational awareness, and mitigate data overload in order to enable Warfighters to rapidly extract meaning from complex, uncertain, and multi-dimensional data sources. Specific work is being vectored to directly support Joint All-Domain Command and Control, with attention to experiments, studies, guidelines, and publications in high-priority and related strategic investment areas.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	14.052	15.559	4.286

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 625329 / <i>Warfighter Interfaces and Teaming</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 funding decreased compared to FY 2024 by \$11.273 million. Funding decrease due to a reduced emphasis in methods for blending data analytics with human cognition for airman decision-making in a complex environment.			
<b>Accomplishments/Planned Programs Subtotals</b>	35.346	44.454	42.884

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602202F / Human Effectiveness Applied Research				<b>Project (Number/Name)</b> 627757 / Bioeffects			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
627757: Bioeffects	0.000	40.811	47.664	46.130	0.000	46.130	29.380	30.050	33.281	33.946	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project conducts applied research on the effects of human exposure to electromagnetic energy (direct current to radio frequency to optical, scalable directed energy weapons, and other novel weapons). This research addresses mechanisms of interactions through fundamental physical principles, biological responses, and physiological outcomes. Research is divided into two core focus areas: novel directed energy bioeffects and mechanisms and directed energy modeling, simulation, and analysis. This research enhances combat survivability and systems effectiveness through technologies that enable deployed forces to counter optical threats and exploit optical systems for offensive applications. In addition, basic biological investigations into the mechanisms associated with high peak power and high average power radio frequency exposure allow for the exploitation of directed energy systems for offensive capabilities while protecting the warfighter from adversarial use of radio frequency technologies. The novel directed energy bioeffects mechanisms research examines the physical, physiological, behavioral, and neural interactions of electromagnetic energy with tissues to understand dose-response effects as well as reveal the means to cause or prevent a specific effect. The directed energy modeling, simulation, and analysis research focuses on new software components that represent and optimize concepts of novel system employment from the Airman standpoint. These components are matured for future transition and application for engagement-to-mission level simulations in which directed energy weapons are employed.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Novel Directed Energy Bioeffects and Mechanisms	14.367	16.682	16.154
<b>Description:</b> Conducts laboratory experiments to provide fundamental knowledge of mechanisms of interaction of directed energy with molecules, cells, tissues, organs, and whole organisms in support of military directed energy systems. Conducts laboratory experiments to understand the mechanistic and behavioral effects of novel weapon incidents to the Airman and to understand the effects of protection strategies on Airman performance.			
<b>FY 2024 Plans:</b> Continue collection and transition of data from multiple parameterization, validation and verification experimental studies to candidate products that support high peak power microwave, high energy laser, and other emerging novel weapon concepts in order to assure valid assessments of real-world concerns and manage the risks associated with technological surprise. Continue studies to further the understanding of high energy effects on critical tissues including dynamic tissue characteristics under high power insult. Extend prior-year studies to include additional near-to-mid infrared parameters to fill data gaps required for materiel selection of laser systems. Continue developing methodologies to understand vulnerabilities and vision effects, including impact of protective systems on color vision. Continue examining mechanisms emerging from subcellular and cellular level response to electromagnetic energy. Continue research that underpins enhanced assessment of operational exposures to battlefield directed energy environments to include counter directed energy weapon technology. Expand research data sets and expertise to activities			



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 627757 / <i>Bioeffects</i>
--	---	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p>that further the development of directed energy policy and exposure standards to maximize interoperability and safe use of technology.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue collection and transition of data from multiple parameterization, validation and verification experimental studies to support modeling simulation and analysis of high peak power microwave, high energy laser, and other emerging novel weapon concepts. This work assures valid assessments of real-world concerns and manages the risks associated with technological surprise.</li> <li>- Continue studies to further the understanding of dynamic tissue characteristics and cellular and subcellular response mechanisms following electromagnetic energy exposure.</li> <li>- Continue prior-year studies on near-to-mid infrared parameters to fill data gaps required for materiel selection of laser systems.</li> <li>- Continue developing methodologies to understand vulnerabilities and vision effects, including impact of protective devices on color vision. Tasks will also provide representation of laser vision impacts in virtual and augmented reality platforms to familiarize the warfighter with those effects.</li> <li>- Continue research that underpins enhanced assessment of operational exposures to battlefield directed energy environments to include counter directed energy weapon technology.</li> <li>- Continue to expand research data sets that further the development of directed energy policy and exposure standards to maximize interoperability and safe use of technology.</li> <li>- Continue to accelerate biological and behavioral investigations of novel waveforms to mitigate technological surprise. Explore relevant mechanisms, dosimetry and diagnostic methodologies , and inform treatment options. Expand upon and validate damage from potential threat systems using advanced imaging technique and systems.</li> <li>- Complete supercontinuum parameterization in the near infrared region to address identified technical gaps and damage thresholds for safety standards.</li> <li>-Initiate assessment of non-linear optical damage from emerging laser threats.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.528 million. Funding decrease due to a reduced emphasis in funding keeping pace with high priority, real-world events.</p>			
--	--	--	--

<p><b>Title:</b> Directed Energy Bioeffects Modeling, Simulation and Analysis</p> <p><b>Description:</b> Conducts physics-level modeling and simulations to represent and optimize directed energy bioeffects to include direct, scalable, and collateral effects.</p> <p><b>FY 2024 Plans:</b></p>	26.444	30.982	29.976
---	--------	--------	--------

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602202F / <i>Human Effectiveness Applied Research</i>	<b>Project (Number/Name)</b> 627757 / <i>Bioeffects</i>
--	---	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
<p>Continue advancing dose-response models to include severity of injury as part of employment risk as a function of directed energy weapon parameters. Continue advancing three-dimensional digital anatomical models for use within physics-level software, and leverage these models against empirical datasets for advanced validation purposes. Continue maturing approaches for utilizing high performance computing to quantify the uncertainty within multi-physics bioeffect simulations of directed energy in end-to-end simulations at the engineering, engagement and mission levels, incorporating models from other collaborative organizations. Continue extending modeling approaches for surrogating physics-level simulations through machine learning approaches, and suitable for integration for digital representation of human throughout analyses.</p> <p><b><i>FY 2025 Plans:</i></b></p> <ul style="list-style-type: none"> <li>- Continue advancing dose-response models to address data parameter gaps and to incorporate severity of injury as part of employment risk as a function of directed energy weapon parameters.</li> <li>- Continue advancing three-dimensional digital anatomical models, increasing resolution, dynamic properties, and adapting for use within advancing physics-level.</li> <li>- Continue maturing approaches for utilizing high performance computing to quantify the uncertainty within multi-physics bioeffect simulations of directed energy in end-to-end simulations at the engineering, engagement, and mission levels, incorporating models from other collaborative organizations.</li> <li>- Continue extending modeling approaches for surrogating physics-level simulations through machine learning approaches, and suitable for integration for digital representation of human throughout analyses.</li> <li>- Continue virtual reality component development for vision effects (glare/dazzle) for transition into 6.3 program.</li> <li>- Initiate dose-response library updates based on most recent scientific data parameterizing responses from emerging systems and severity of injury.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$1.006 million. Funding decrease due to a reduced emphasis in funding keeping pace with high priority, real-world events.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	40.811	47.664	46.130

**C. Other Program Funding Summary (\$ in Millions)**  
N/A

**Remarks**

**D. Acquisition Strategy**  
Not applicable

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 2: Applied Research	<b>R-1 Program Element (Number/Name)</b> PE 0602203F I Aerospace Propulsion
--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	201.798	184.867	339.477	0.000	339.477	349.289	356.433	398.813	406.627	Continuing	Continuing
622401: Structures	-	0.000	0.000	76.135	0.000	76.135	77.898	79.468	85.722	87.448	Continuing	Continuing
622403: Flight Controls and Pilot-Vehicle Interface	-	0.000	0.000	42.659	0.000	42.659	43.570	44.519	62.051	63.304	Continuing	Continuing
622405: High Speed Systems Technology	-	0.000	0.000	41.137	0.000	41.137	42.083	42.949	45.778	46.708	Continuing	Continuing
623012: Advanced Propulsion Technology	-	17.335	18.638	18.430	0.000	18.430	18.838	19.224	20.739	21.159	Continuing	Continuing
623048: Combustion and Mechanical Systems	-	4.653	4.845	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
623066: Turbine Engine Technology	-	76.045	73.533	76.546	0.000	76.546	80.462	82.068	88.610	90.181	Continuing	Continuing
623145: Aerospace Power Technology	-	59.325	39.602	38.640	0.000	38.640	39.461	40.271	44.090	44.963	Continuing	Continuing
625171: Missile Rocket Propulsion	-	35.991	39.233	36.945	0.000	36.945	37.788	38.558	41.808	42.646	Continuing	Continuing
625330: Aerospace Fuel Technology	-	8.449	9.016	8.985	0.000	8.985	9.189	9.376	10.015	10.218	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program investigates, develops, and analyzes aerospace system technologies for military applications that remove operational limitations and advance warfighter capabilities critical to the future threat. The specific areas of applied research are in:

- Structures: Develops and exploits advanced aerodynamic vehicle configurations, new materials, fabrication processes, design techniques, and incorporates vehicle, inter-vehicle, and intra-vehicle control systems enabling advanced capabilities for the Air Force.

- Flight Controls and Pilot-Vehicle Interface: Develops technologies that enable maximum affordable capability focusing on manned and autonomous collaborative platforms for military applications that remove operational limitations and enable advanced vehicle designs and mission systems.

UNCLASSIFIED

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	
<p>- High Speed Systems Technology: Develops high speed/hypersonic aerospace systems technologies to include advanced high temperature structures and advanced aerodynamic vehicle configurations enabling future high speed weapons and platforms; intelligence, surveillance, and reconnaissance systems; and multi-domain vehicles.</p> <p>- Advanced Propulsion Technology: Develops high speed (to include hypersonic) aerospace vehicles as well as high-speed air breathing propulsion enabling revolutionary capabilities for near peer-to-peer competition.</p> <p>- Combustion and Mechanical Systems: Evaluates lubricants, for advanced turbine engines, and combined cycle engines with emphasis on low cost and high speed applications.</p> <p>- Turbine Engine Technology: Develops engine technology to address military specific needs for manned systems, autonomous collaborative platforms, and munition applications in various class sizes.</p> <p>- Aerospace Power Technology: Develops electrical and thermal control technologies for military applications that remove operational limitations enabling advanced vehicle designs and high-power mission systems.</p> <p>- Missile Rocket Propulsion: Develops rocket propulsion technologies for the design, development, and fabrication of strategic systems and tactical missiles enabling timely and affordable capacity.</p> <p>- Aerospace Fuel Technology: Evaluates fuels and related technologies to enable increased performance and affordability of high speed and munition capabilities.</p> <p>In FY 2025, the RDT&amp;E Budget Activity 02 (BA02) Aerospace Vehicles Technologies efforts and activities under PE 0602201F, are transferred to PE 0602203F, Aerospace Propulsion for increased integration between airframe, flight control, propulsion, electrical, power and thermal management.</p> <p>In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622401 Structures, is transferred to PE 0602203F, Aerospace Propulsion, Project 622401 Structures.</p> <p>In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622404, Aeromechanics, is transferred to PE 0602203F, Aerospace Propulsion, Project 622401 Structures.</p> <p>In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622403, Flight Controls and Pilot-Vehicle Interface, is transferred to PE 0602203F, Aerospace Propulsion, Project 622403 Flight Controls and Pilot-Vehicle Interface.</p> <p>In FY 2025, the entirety of P E 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology, is transferred to PE 0602203F, Aerospace Propulsion, Project 622405 High Speed Systems Technology.</p>		

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>
---	---

Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

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 program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602204F, 0602602F, 0602605F, 0602788F, 0602298F, and 1206601SF.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

Funds in this program element may be used to investigate specified technology advancements in multiple 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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	212.361	184.867	178.396	0.000	178.396
Current President's Budget	201.798	184.867	339.477	0.000	339.477
Total Adjustments	-10.563	0.000	161.081	0.000	161.081
• 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	11.904	0.000			
• SBIR/STTR Transfer	-5.553	0.000			
• Other Adjustments	-16.914	0.000	161.081	0.000	161.081

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 623066: *Turbine Engine Technology*

Congressional Add: *Program Increase - Modular open system architecture for turbine engine technology*

Congressional Add Subtotals for Project: 623066

**Project:** 623145: *Aerospace Power Technology*

	<b>FY 2023</b>	<b>FY 2024</b>
	7.803	-
	7.803	-

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>
---	---

<b>Congressional Add Details (\$ in Millions, and Includes General Reductions)</b>	<b>FY 2023</b>	<b>FY 2024</b>
Congressional Add: <i>Emergency power and cooling thermal management growth</i>	8.267	-
Congressional Add: <i>Modular cooling capacity for tactical aircraft</i>	3.477	-
Congressional Add: <i>Program Increase - high mach turbine engine</i>	9.754	-
Congressional Add: <i>High voltage aircraft power</i>	1.950	-
Congressional Add: <i>Improving reliability of electrical systems for future aircraft</i>	4.877	-
Congressional Add Subtotals for Project: 623145	28.325	-
Congressional Add Totals for all Projects	36.128	-

**Change Summary Explanation**

FY 2025 funding increased compared to FY 2024 by \$154.61 million. The increase is due to the transfer of PE 0602201F, Aerospace Vehicle Technology, efforts to PE 0602203F, Aerospace Propulsion.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602203F / Aerospace Propulsion				<b>Project (Number/Name)</b> 622401 / Structures			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622401: Structures	-	0.000	0.000	76.135	0.000	76.135	77.898	79.468	85.722	87.448	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops advanced structures concepts to exploit new materials and fabrication processes and investigates new concepts and design techniques. New structural concepts include low-cost design and fabrication techniques, incorporating subsystem hardware items, and adaptive mechanisms into the aerospace structures and/or skin of the platform.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622401 Structures and Project 622404 Aeromechanics, is transferred to PE 0602203F, Aerospace Propulsion, Project 622401 Structures. This is an administrative realignment to provide increased execution flexibility and not a new start.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>Title:</b> Vehicle Design Technologies</p> <p><b>Description:</b> Develop methodologies to reduce the cost and time involved from design to full-scale testing of structural concepts and aerospace systems.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, Vehicle Design Technologies effort.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue the development of advanced high fidelity aircraft design tools.</li> <li>- Continue the development of new design methods that link vehicle system requirements to mission operation performance.</li> <li>- Continue the integration of model-based systems engineering design tools with quantified risk methodologies.</li> <li>- Continue integration of affordable manufacturing considerations in air vehicle design.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$17.730 million. \$0.407 million decreased due to reduced emphasis in vehicle design. \$18.137 million increased due to transfer of Vehicle Design Technologies effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, Vehicle Design Technologies effort.</p>	0.000	0.000	17.730
<p><b>Title:</b> Structural Concepts</p> <p><b>Description:</b> Develop design methods, processes, and lightweight, adaptive, and multifunctional structural concepts to capitalize on new materials, multi-role considerations, and technology integration into aircraft systems.</p>	0.000	0.000	24.496

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 622401 / <i>Structures</i>
--	---	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p><b>FY 2024 Plans:</b> Develop design methods, processes, and lightweight, adaptive, and multifunctional structural concepts to capitalize on new materials, multi-role considerations, and technology integration into aircraft systems.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue development of low-cost agile manufacturing concepts for structures in support of the development of a next variant of a low-cost unmanned aerospace system.</li> <li>- Continue digital and systems engineering assessments for the development of airworthiness certification criteria for advanced airframe structures.</li> <li>- Continue the validation of innovative structural design methods to dramatically reduce weight and complexity of aircraft structures.</li> <li>- Continue the demonstration of the fatigue life of bonded unitized composite structures for the next generation of aircraft.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$24.496 million. \$0.442 million decreased due to reduced emphasis in structural concepts. \$24.938 million increased due to realignment of Structural Concepts effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, Structural Concepts effort.</p>			
--	--	--	--

<p><b>Title:</b> Next Generation Aerodynamic Technologies</p> <p><b>Description:</b> Develop and assess technologies for the next generation of multi-role large aircraft.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, Next Generation Aerodynamic Technologies effort.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue the development of advanced, high fidelity, aerodynamic analysis tools for aircraft conceptual design.</li> <li>- Continue assessment of innovative next generation vehicle concepts.</li> <li>- Continue digital modeling and simulation development for the assessment of fuel and energy use.</li> <li>- Initiate the assessment of fuel and energy saving techniques for fleet application.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$7.679 million. \$0.361 million of the increase is due to increased emphasis in aerodynamic technologies for autonomous collaborative platforms. \$7.318 million of the increase is due to realignment of Next</p>	0.000	0.000	7.679
--	-------	-------	-------



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 622401 / <i>Structures</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
Generation Aerodynamic Technologies effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, Next Generation Aerodynamic Technologies effort.				
<p><b>Title:</b> Aircraft Integration Technologies</p> <p><b>Description:</b> Develop enabling technologies to allow efficient and effective integration of propulsion, weapons, and subsystems into current and future air vehicles.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, Aircraft Integration Technologies effort.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete the development of novel kinetic weapons integration technologies for enhanced weapon payload in affordable platforms.</li> <li>- Continue the development of a modeling and simulation approach to the design and integration of embedded propulsion systems.</li> <li>- Initiate the demonstration of integrated propulsion for next generation air vehicle conceptual design.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$16.836 million. \$0.336 million decreased due to completion of kinetic weapons integration technologies in affordable platforms. \$17.174 million of the increase is due to realignment of Aircraft Integration Technologies effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, Next Generation Aerodynamic Technologies effort.</p>		0.000	0.000	16.838
<p><b>Title:</b> Aerodynamic Systems Technologies</p> <p><b>Description:</b> Develop aerodynamic assessment prediction methods centered on expanding the design capabilities of future air vehicles.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0602201F, Aerospace Vehicle Technologies, Project 622404, Aeromechanics, Aerodynamic Systems Technologies effort.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue the assessment and development of incorporating active flow control techniques into advanced, mission utility informed, aircraft vehicle configuration design techniques.</li> <li>- Complete design assessments of long-endurance unmanned platforms.</li> <li>- Continue the development of prediction methods which include air vehicle stability and control</li> </ul>		0.000	0.000	9.392

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 622401 / <i>Structures</i>
--	---	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
requirements. - Initiate the technology maturation of long-endurance unmanned aircraft vehicle design.			
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 increased compared to FY 2024 by \$9.392 million. \$0.743 million decrease is due to design assessment completion of long-endurance unmanned platforms. \$10.135 million increase is due to realignment of Aerodynamic Systems Technologies effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622404, Aeromechanics, Aerodynamic Systems Technologies effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.000	76.135

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602203F / Aerospace Propulsion				<b>Project (Number/Name)</b> 622403 / Flight Controls and Pilot-Vehicle Interface			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622403: <i>Flight Controls and Pilot-Vehicle Interface</i>	-	0.000	0.000	42.659	0.000	42.659	43.570	44.519	62.051	63.304	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops technologies that enable affordable mass and maximum capabilities for manned, remotely-piloted, and autonomous aerospace vehicles. Advanced control, automation, and autonomy technologies are developed for optimal vehicle performance throughout the flight envelope and evaluated in virtual simulation environments through full-scale testing. Resulting technologies contribute significantly towards the development of reliable autonomous collaborative platforms, high-speed aircraft, and extended-life legacy aircraft.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622403 Flight Controls and Pilot-Vehicle Interface, is transferred to PE 0602203F, Aerospace Propulsion, Project 622403 Flight Controls and Pilot-Vehicle Interface. This is an administrative realignment to provide increased execution flexibility and not a new start.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Advanced Flight Controls Technologies	0.000	0.000	10.120
<b>Description:</b> Develop technologies for advanced control-enabled capabilities, including flight controls, components, integrated vehicle management systems, and software and system certification techniques for both manned aircraft and autonomous collaborative platforms.			
<b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0602201F, Aerospace Vehicle Technologies, Project 622403, Flight Controls and Pilot-Vehicle Interface, Advanced Flight Controls Technologies effort.			
<b>FY 2025 Plans:</b> - Continue the development of a trusted autonomy approach, integrating certification and assurance processes and autonomy development including tool development to enhance the use of formal methods in autonomy development to accelerate validation of autonomy algorithms and transition timelines. - Continue the development, demonstration, and assessment of advanced autonomy capabilities for dynamic tasking in complex environments including development of knowledge-based AI decision architecture toward robust mission management for heterogeneous teams of autonomous collaborative platforms. - Continue the development of autonomy optimization and assurance in dynamic and uncertain environment including rigorous extensions to optimization techniques to enable better autonomous behavior under uncertainty.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 622403 / <i>Flight Controls and Pilot-Vehicle Interface</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 increased compared to FY 2024 by \$10.120 million. \$0.642 million of the increase is due to increased emphasis in of flight control technologies for autonomous collaborative platforms. \$9.478 million of the increase is due to realignment of Advanced Flight Controls Technologies effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622403, Flight Controls and Pilot-Vehicle Interface, Advanced Flight Controls Technologies effort.				
<p><b>Title:</b> Manned and Unmanned Teaming Technologies</p> <p><b>Description:</b> Develop technology for flight control systems that will permit safe interoperability between manned aircraft and autonomous collaborative platforms and effective teaming in adverse and contested environments.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0602201F, Aerospace Vehicle Technologies, Project 622403, Flight Controls and Pilot-Vehicle Interface, Manned and Unmanned Teaming Technologies effort.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete the development of tactical autonomy for manned-unmanned teams in contested, dynamic mission environments.</li> <li>- Continue the development of mission management autonomy for manned-unmanned team to include extending an autonomy framework for autonomous collaborative platforms to be able to leverage existing autonomy library.</li> <li>- Continue the development, demonstration, and assessment of autonomous behaviors to address mission capability gaps to include modeling, simulation, and assessment of dynamic task allocation behaviors to better inform this and other autonomy developments.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$24.552 million. \$1.407 million of the increase is due to increased emphasis in autonomy teaming for autonomous collaborative platforms. \$23.144 million of the increase is due to realignment of Manned and Unmanned Teaming Technologies effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622403, Flight Controls and Pilot-Vehicle Interface, Manned and Unmanned Teaming Technologies effort.</p>		0.000	0.000	24.552
<p><b>Title:</b> Flight Controls Technologies Modeling and Simulation</p> <p><b>Description:</b> Develop tools and methods for capitalizing on simulation-based research and development of future aerospace vehicles.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0602201F, Aerospace Vehicle Technologies, Project 622403, Flight Controls and Pilot-Vehicle Interface, Flight Controls Technologies Modeling and Simulation effort.</p> <p><b>FY 2025 Plans:</b></p>		0.000	0.000	7.987

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 622403 / <i>Flight Controls and Pilot-Vehicle Interface</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Complete manned-unmanned teaming evaluations including rapid development of new integrated capabilities.</li> <li>- Continue analyses of concepts for future advanced development capabilities.</li> <li>- Continue modeling and simulation efforts to assess emerging aerospace technologies in complex and dynamic battlespace environments.</li> <li>- Continue digital engineering efforts to create a digital continuum of military utility and cost effectiveness analysis for investment planning from technology development to technology transition.</li> <li>- Initiate foundational and applied research into mission engineering.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 increased compared to FY 2024 by \$7.987 million. \$0.694 million of the increase is due to increased emphasis of applied research into mission engineering. \$7.293 million of the increase is due to realignment of Flight Controls Technologies Modeling and Simulation effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622403, Flight Controls and Pilot-Vehicle Interface, Flight Controls Technologies Modeling and Simulation effort.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.000	42.659

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602203F / Aerospace Propulsion				<b>Project (Number/Name)</b> 622405 / High Speed Systems Technology			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622405: High Speed Systems Technology	-	0.000	0.000	41.137	0.000	41.137	42.083	42.949	45.778	46.708	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This effort investigates, analyzes, and develops high speed/hypersonic aerospace vehicle technologies. Advanced high temperature structures concepts are explored and developed to exploit new materials, fabrication processes, and design techniques. Advanced aerodynamic vehicle configurations are developed and analyzed through simulations, experiments, and multi-disciplinary analyses. Advanced subsystem, integration and analysis technologies are developed and simulated for hypersonic vehicles. These technologies will enable future high speed weapons and platforms; intelligence, surveillance, and reconnaissance systems; and space access vehicles.

In FY 2025, the entirety of PE 0602201F, Aerospace Vehicle Technologies, Project 622405 High Speed Systems Technology, is transferred to PE 0602203F, Aerospace Propulsion, Project 622405 High Speed Systems Technology. This is an administrative realignment to provide increased execution flexibility and not a new start.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> High Speed Systems Technology	0.000	0.000	23.885
<b>Description:</b> Develop design analysis methods and technologies for high speed systems at extreme flight conditions.			
<b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology, High Speed Systems Technology effort.			
<b>FY 2025 Plans:</b>			
- Continue critical technology maturation for high speed/ hypersonic systems with secondary emphasis on longer range flight and heavier payloads.			
- Continue maturation of innovative aerospace structural concepts, analytical methods, service life predictions, airframe/engine integration, fluid/thermal/structural interactions and thermal management techniques.			
- Continue development of high speed system concepts, including flight research concepts, to provide revolutionary capabilities for affordable expendable systems and robust reusable systems.			
- Continue efforts to characterize high-speed vehicle system phenomena, develop and validate fundamental high-speed component technologies through computational analysis, ground, and flight testing.			
- Initiate critical technology maturation for high speed/ hypersonic systems with primary emphasis on reusable platforms/systems, including: validated modeling, simulation, and analysis techniques, mission system integration, operability and performance over expanded mission requirements, vehicle durability, and vehicle-level thermal management.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 622405 / <i>High Speed Systems Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p>FY 2025 increased compared to FY 2024 by \$23.885 million. \$0.645 million of the increase is due to increased emphasis of critical technology maturation for high speed/hypersonic systems. \$23.240 million of the increase is due to realignment of High Speed Systems Technology effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology, High Speed Systems Technology effort.</p>			
---	--	--	--

<b>Title:</b> High Speed Vehicle Aeromechanics and Integration	0.000	0.000	17.252
--	-------	-------	--------

**Description:** Develop new and improved components, concepts, and designs for sustained flight of high-speed/hypersonic expendable and re-useable vehicles. Conduct analyses of high speed/hypersonic vehicles to enable revolutionary capabilities.

**FY 2024 Plans:**

For FY 2024 and prior years, this work is performed under PE 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology, High Speed Vehicle Aeromechanics and Integration effort.

**FY 2025 Plans:**

- Continue to mature critical technologies for high speed/hypersonic flight with primary emphasis on reusable systems and secondary emphasis on longer range and heavier payloads.
- Continue development of multi disciplinary design and analysis techniques and tools with emphasis on the digital engineering environment.
- Continue development of high speed system concepts that provide revolutionary capabilities through configuration research.
- Continue investigation of aeromechanic technologies to evaluate uncertainty, improve instrumentation accuracy and safe multi-body physics
- Continue efforts to characterize high-speed aeromechanics phenomena and develop and validate fundamental high-speed component technologies through computational analysis, ground, and flight testing.
- Continue investigation of advanced aeromechanic technologies to extend system range through improvement of system lift/drag ratio and maintain robust stability and control at all flight conditions.
- Continue investigation of computational and ground based experimental approaches to improved air induction systems over a wide range of flight conditions.
- Initiate critical technology maturation for high speed/ hypersonic systems with primary emphasis on reusable platforms/systems, including: validated modeling, simulation, and analysis techniques, mission system integration, operability and performance over expanded mission requirements, vehicle durability, and vehicle-level thermal management.
- Initiate critical vehicle aeromechanics and integration technology maturation for high speed/ hypersonic systems with primary emphasis on reusable platforms/systems, including: validated modeling, simulation, and analysis techniques, mission system integration, operability and performance over expanded mission requirements, vehicle durability, and vehicle-level thermal management.

**FY 2024 to FY 2025 Increase/Decrease Statement:**

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 622405 / <i>High Speed Systems Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
FY 2025 increased compared to FY 2024 by \$17.252 million. \$0.466M of the increase is due to increased emphasis of vehicle aeromechanics and integration for high speed systems. \$16.786 million of the increase is due to realignment of High Speed Vehicle Aeromechanics and Integration effort from PE 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology, High Speed Vehicle Aeromechanics and Integration effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.000	41.137

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>				<b>Project (Number/Name)</b> 623012 / <i>Advanced Propulsion Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
623012: <i>Advanced Propulsion Technology</i>	-	17.335	18.638	18.430	0.000	18.430	18.838	19.224	20.739	21.159	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops combined/advanced cycle air breathing high-speed and hypersonic propulsion technologies to provide revolutionary propulsion options for the Air Force. These new engine technologies will enable future high-speed/hypersonic weapons and aircraft concepts. The primary focus is on hydrocarbon-fueled engines capable of operating over a broad range of flight Mach numbers. Efforts include modeling, simulations, and proof of concept demonstrations of critical components; advanced component development; and ground-based demonstrations.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Hypersonic Scramjet Technologies	17.335	18.638	18.430
<b>Description:</b> Develop robust high-speed and hypersonic propulsion technologies, including hydrocarbon fueled scramjet, ramjet, and combined cycle engine components and technologies to improve performance, operability, durability, and scalability for future platforms.			
<b>FY 2024 Plans:</b> Continue development and demonstration of advanced, high speed engine components to improve operating margin and operating time for expendable and reusable applications; complete scaling laws element of research. Continue development of low internal drag flame stabilization devices, instrumentation, endothermic fuels, and flight test engine components. Continue development of design and analysis techniques and tools as well as experimental approaches to enable enhanced high-speed air induction system starting, operability, and performance for propulsion integration concepts over a wide range of flight conditions. Continue propulsion studies and design efforts required for the development and demonstration of an engine flight test that expands the flight environment of current high speed propulsion systems.			
<b>FY 2025 Plans:</b> - Continue development and demonstration of advanced, high speed engine components to improve operating margin and operating time for expendable and reusable applications. - Continue development of low internal drag flame stabilization devices, instrumentation, endothermic fuels, and flight test engine components. - Continue development of design and analysis techniques and tools as well as experimental approaches to enable enhanced high-speed air induction system starting, operability, and performance for propulsion integration concepts over a wide range of flight conditions. - Continue propulsion studies and design efforts required for the development and demonstration of an engine flight test that expands the flight environment of current high speed propulsion systems.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 623012 / <i>Advanced Propulsion Technology</i>
--	---	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
- Initiate critical technology maturation for high speed and hypersonic propulsion systems with primary emphasis on reusable platforms/systems, including validated modeling, simulation, and analysis techniques, engine operability and performance over expanded flight Mach number ranges, propulsive system durability, and thermal management.  <b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$0.208 million due to completion of scaling laws research.			
<b>Accomplishments/Planned Programs Subtotals</b>	17.335	18.638	18.430

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>				<b>Project (Number/Name)</b> 623048 / <i>Combustion and Mechanical Systems</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
623048: <i>Combustion and Mechanical Systems</i>	-	4.653	4.845	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project evaluates lubricants, for advanced turbine engines, and combined cycle engines with emphasis on low cost and high speed applications.

In 2025, Lubricant Technologies effort in this project will transfer to Program 0602203F, Aerospace Propulsion, Project 623066, Turbine Engine Technology, in order to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Lubricant Technologies	4.653	4.845	0.000
<b>Description:</b> Develop, test, and model advanced turbine engine lubricants and applied lubrication technologies.			
<b>FY 2024 Plans:</b> Complete developing innovative fluids by; defining target requirements for new polyolester oils, conduct Research & Development for new/enhanced turbine engine oils for legacy & emerging engines, qualify new & updated engine oil products for legacy & emerging engines. Continue the development of lubricant modeling through characterization of heat generation, lubrication system cooling effectiveness, failure progression of bearing materials under relevant engine conditions, and overall system performance of advanced bearing concepts for model validation. Complete supporting the warfighter on field-related mechanical system issues. Continue performance validation study of lubricant & lubrication system components via full-scale high-fidelity laboratory parametric testing at representative engine operating conditions. Continue development of applied rotor dynamics models for design. Initiate studies on bearings nonoil lubrication technologies for limited life systems.			
<b>FY 2025 Plans:</b> In 2025, Lubricant Technologies effort in this project will transfer to Program 0602203F, Aerospace Propulsion, Project 623066, Turbine Engine Technology, in order to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$4.845 million due to a transfer to Program 0602203F, Aerospace Propulsion, Project 623066, Turbine Engine Technology, in order to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies.			
<b>Accomplishments/Planned Programs Subtotals</b>	4.653	4.845	0.000

UNCLASSIFIED

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 623048 / <i>Combustion and Mechanical Systems</i>

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602203F / Aerospace Propulsion				<b>Project (Number/Name)</b> 623066 / Turbine Engine Technology			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
623066: <i>Turbine Engine Technology</i>	-	76.045	73.533	76.546	0.000	76.546	80.462	82.068	88.610	90.181	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops air breathing engine technology to address military specific needs for manned systems, autonomous vehicles, and munition applications. This project develops turbine engine components and evaluates revolutionary air breathing propulsion technology by utilizing military utility and physics-based analysis.

In FY 2025, Lubricant Technologies efforts will transfer from PE 0602203F, Aerospace Propulsion, Project 623048, Combustion and Mechanical Systems, to this Project 623066 Turbine Engine Technology, to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Turbine Engine Components	23.761	26.339	26.339
<b>Description:</b> Develop core turbofan/turbojet engine components (i.e., compressors, and turbines) for strike and air superiority capabilities.			
<b>FY 2024 Plans:</b> Continue development of improved aerodynamic design tools and analysis methods to extend engine operability and efficiency. Continue transonic fan distortion tolerance and transfer study to enable design-for-integration and reliable assessment for embedded engines. Continue high lift /high work turbine study to reduce turbine stage /blade count. Initiate design of compressors and turbines for limited life and affordability.			
<b>FY 2025 Plans:</b> - Continue development of improved aerodynamic design tools and analysis methods to extend engine operability and efficiency by advancing rules and tools to perform integrated engine design to meet modeling, simulation, and analysis defined capabilities. - Continue transonic fan distortion tolerance and transfer study to enable design-for-integration and reliable assessment for embedded engines by advancing design activities for distortion tolerant fan components. - Continue high lift /high work turbine study to reduce turbine stage /blade count. - Continue design of compressors and turbines for limited life and affordability. - Initiate demonstration of high efficiency, high durability propulsion components tailored for embedded systems. - Initiate engine component validated methodologies to trade engine life, cost and performance.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable			
<b>Title:</b> Turboshaft/Turboprop and Turbofan Engine Technologies	4.896	4.896	0.553

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 623066 / <i>Turbine Engine Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

**Description:** Develop components for turboshaft/turboprop and small turbofan engines for trainers, special operations aircraft, and long range strike.

**FY 2024 Plans:**

Continue the exploration of new small engine technologies that can operate in high-speed applications; Complete evaluation of risk reduction technologies to increase usage time of systems. Complete utilizing validation data to develop improved test protocol for small engine designs. Continue exploration of new small and medium size engine technologies for increased fuel efficiency, propulsive capability, power and thermal management, and reduced life cycle cost. Continue identification of new architectures and critical technologies for integrated power and thermal systems. Continue identification of requirements and develop models for simulation of highly integrated systems.

**FY 2025 Plans:**

- Complete exploration of new small engine technologies that can operate in high-speed applications.
- Complete exploration of new small and medium size engine technologies for increased fuel efficiency, propulsive capability, power and thermal management, and reduced life cycle cost.
- Complete identification of new architectures and critical technologies for integrated power and thermal systems.
- Complete identification of requirements and develop models for simulation of highly integrated systems.

**FY 2024 to FY 2025 Increase/Decrease Statement:**

FY 2025 decreased compared to FY 2024 by \$4.343 million. Funding decreased due to completion of turboshaft/turboprop and small engine technology development and increased emphasis in turbine engine components.

<b>Title:</b> Revolutionary Propulsion Technology	17.321	18.587	18.587
---	--------	--------	--------

**Description:** Develop, test, and evaluate revolutionary propulsion concepts for gas turbine, pressure gain propulsion, and combined cycle engines for missiles, manned and unmanned systems.

**FY 2024 Plans:**

Complete identification of control technology elements applicable to integrated propulsion/power/thermal solutions. Continue evaluation of integration of advanced augmentors and ramburners. Continue exploration of new expendable and attritable architectures. Continue the development and evaluation of advanced, integrated propulsion technologies for supersonic expendable, attritable, and reusable strike and Intelligence, Surveillance, and Reconnaissance (ISR) systems. Continue studies for exploration of advanced propulsion technologies. Initiate studies in hypersonic combined cycles.

**FY 2025 Plans:**

- Continue evaluation of integration of advanced augmentors and ramburner.
- Complete exploration of new expendable and affordable architectures.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 623066 / <i>Turbine Engine Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Complete the development and evaluation of advanced, integrated propulsion technologies for supersonic expendable, affordable, and reusable strike and Intelligence, Surveillance, and Reconnaissance (ISR) systems.</li> <li>- Continue studies for exploration of advanced propulsion technologies.</li> <li>- Continue studies in hypersonic combined cycles.</li> <li>- Initiate operational benefits and military utility analysis of air breathing propulsion technologies.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable</p>				
<p><b>Title:</b> Engine Technologies for Autonomous Vehicles and Munitions</p> <p><b>Description:</b> Develop methodologies to design low cost and limited life engine components for autonomous vehicles and munitions.</p> <p><b>FY 2024 Plans:</b> Continue evaluation of power and thermal modeling of advanced architectures into aircraft system level multidisciplinary analysis and optimization tools: explore new control methods for integrated propulsion, power and thermal management. Continue exploration of new expendable and attritable architectures. Continue exploration of new engine concepts for missile and unmanned systems. Continue lifetime demonstration of limited life engine components. Initiate Multi-disciplinary design &amp; optimization, systems engineering &amp; digital engineering frameworks. Initiate development of predictive analysis tools to enable reliable, sufficiently durable component designs for Autonomous Collaborative Platforms (ACP).</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete evaluation of power and thermal modeling of advanced architectures into aircraft system level multidisciplinary analysis and optimization tools: explore new control methods for integrated propulsion, power, and thermal management.</li> <li>- Complete exploration of new expendable and affordable architectures.</li> <li>- Complete exploration of new engine concepts for missile and unmanned systems.</li> <li>- Complete lifetime demonstration of limited life engine components.</li> <li>- Continue Multi-disciplinary design &amp; optimization, systems engineering &amp; digital engineering frameworks.</li> <li>- Continue development of predictive analysis tools to enable reliable, sufficiently durable component designs for Autonomous Collaborative Platforms (ACP).</li> <li>- Initiate component failure mode investigations.</li> <li>- Initiate studies in reducing the overall time required for engine development and design cycle.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>		13.521	14.590	20.789

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 623066 / <i>Turbine Engine Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 increased compared to FY 2024 by \$6.199 million. Funding increased due to increased emphasis in Engine Technologies for Autonomous Vehicles and Munitions needed for component failure mode investigations and reducing engine development and design cycle.				
<p><b>Title:</b> Combustion Technologies</p> <p><b>Description:</b> Develop, test, and evaluate revolutionary combustion and propulsion concepts for gas turbine, pulse detonation, and combined cycle engines for missiles, limited life systems.</p> <p><b>FY 2024 Plans:</b> Complete exploring interactions and effects of compressor and turbine components on the combustor and combustor materials to increase efficiency and improve altitude ignition &amp; operability. Complete development of computations, modeling and simulation, and research experimentation of advanced combustion concepts including pressure gain combustion components and system level architectures. Continue the development and demonstration of new design, modeling and simulation and testing methods to improve efficiency and operability. Continue investigation to identify and assess disruptive propulsion/power concepts and evaluate concepts. Continue development of new technologies for unmanned aircraft system propulsion/power systems for improved understanding at relevant operating conditions. Continue exploration of applied high speed combustion and combustor design. Continue exploration of rotating detonation engines for next generation combustion systems. Continue the development of improved numerical methods and combustion models to guide design and applied development of combustion components and systems.</p> <p><b>FY 2025 Plans:</b> - Complete the development and demonstration of new design, modeling and simulation and testing methods to improve efficiency and operability. - Complete investigation to identify and assess disruptive propulsion/power concepts and evaluate concepts. - Complete development of new technologies for unmanned aircraft system propulsion/power systems for improved understanding at relevant operating conditions. - Complete exploration of applied high speed combustion and combustor design. - Complete exploration of rotating detonation engines for next generation combustion systems. - Complete the development of improved numerical methods and combustion models to guide design and applied development of combustion components and systems.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$3.081 million. Funding decreased due to decreased emphasis in combustion component technologies and increased emphasis in Engine Technologies for Autonomous Vehicles and Munitions.</p>		4.788	5.166	2.085
<b>Title:</b> Diagnostic Technologies		0.822	0.822	0.215



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 623066 / <i>Turbine Engine Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>Description:</b> Develop and demonstrate optical, electromechanical, and laser diagnostic tools and sensors for application to revolutionary propulsion technologies.</p> <p><b>FY 2024 Plans:</b> Complete development of diagnostic tools/ methods for robust measurement capability in engine test cells and full annular ground test environments including reacting and nonreacting spray experiments for liquid fuel spray model development and employment of nonintrusive optical diagnostics that will be used to obtain accurate, spatially/temporally resolved data. Continue the application of optical diagnostic to challenging engine environments including detonations, high pressures, and multiphase.</p> <p><b>FY 2025 Plans:</b> Complete the application of optical diagnostic to challenging engine environments including detonations, high pressures, and multiphase.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.607 million. Funding decreased due to decreased emphasis in diagnostic technologies and increased emphasis Engine Technologies for Autonomous Vehicles and Munitions.</p>				
<p><b>Title:</b> Bearing Technologies</p> <p><b>Description:</b> Develop and test advanced bearing material technology and bearing concepts for small, intermediate, and large-scale turbine engine applications.</p> <p><b>FY 2024 Plans:</b> Complete developing physics-based bearing life model based on bearing alloy fatigue and microstructural investigations, including bearing life factors for advanced bearing materials. Complete incorporating fatigue life, fault evolution, and parametric heat generation of advanced material systems into the models. Continue development of oil-free bearing technology for Unmanned Air Systems. Continue the development and demonstration of propulsion technologies for subsonic expendable and attritable air platforms, small and medium scale propulsion technologies, and evaluate lubricants, mechanical systems, bearing technology and combustion concepts for advanced turbine engines. Continue the development of fundamental knowledge of bearing material rolling contact fatigue failure mechanisms and lubricant interactions through microstructural investigations and failure analysis. Initiate macro failure mode investigations as a function of underlying microstructure and material fatigue life.</p> <p><b>FY 2025 Plans:</b> - Complete development of oil-free bearing technology for Unmanned Air Systems. - Complete the development and demonstration of propulsion technologies for subsonic expendable and attritable air platforms, small and medium scale propulsion technologies, and evaluate lubricants, mechanical systems, bearing technology and combustion concepts for advanced turbine engines.</p>		3.133	3.133	3.133

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 623066 / <i>Turbine Engine Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<ul style="list-style-type: none"> <li>- Complete the development of fundamental knowledge of bearing material rolling contact fatigue failure mechanisms and lubricant interactions through microstructural investigations and failure analysis</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable</p>			
--	--	--	--

<p><b>Title:</b> Lubricant Technologies</p> <p><b>Description:</b> This project evaluates lubricants, for advanced turbine engines, and combined cycle engines with emphasis on low cost and high speed applications.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0602203F, Aerospace Propulsion, Project 623048, Combustion and Mechanical Systems, Lubricant Technologies</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete the development of lubricant modeling through characterization of heat generation, lubrication system cooling effectiveness, failure progression of bearing materials under relevant engine conditions, and overall system performance of advanced bearing concepts for model validation.</li> <li>- Complete performance validation study of lubricant &amp; lubrication system components via full-scale high-fidelity laboratory parametric testing at representative engine operating conditions.</li> <li>- Complete development of applied rotor dynamics models for design.</li> <li>- Continue studies on bearings nonoil lubrication technologies for limited life systems.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$4.845 million. Funding increased due to transfer of Lubricant Technologies effort from PE 0602203F, Aerospace Propulsion, Project 623048, Combustion and Mechanical Systems, Lubricant Technologies effort.</p>	0.000	0.000	4.845
<b>Accomplishments/Planned Programs Subtotals</b>	68.242	73.533	76.546

	<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Program Increase - Modular open system architecture for turbine engine technology	7.803	-
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts.		
<b>Congressional Adds Subtotals</b>	7.803	-

<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A
---

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602203F / <i>Aerospace Propulsion</i>	Project (Number/Name) 623066 / <i>Turbine Engine Technology</i>

**C. Other Program Funding Summary (\$ in Millions)**

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>				<b>Project (Number/Name)</b> 623145 / <i>Aerospace Power Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
623145: <i>Aerospace Power Technology</i>	-	59.325	39.602	38.640	0.000	38.640	39.461	40.271	44.090	44.963	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops integrated electrical and thermal management components, controls and systems for military aerospace applications. Power component technologies are developed to increase reliability, maintainability, commonality, affordability, and supportability of aircraft and flight line equipment. Research is conducted in energy storage and hybrid power system technologies to enable special purpose applications. Electrical power and thermal management technologies enable future military power and thermal needs. Controls and system integration technologies ensure the interoperability of aircraft, power, thermal, engine and other systems and subsystems. This project supports development of electrical power and thermal management components, controls and systems suitable for applications to legacy and future aircraft platforms including strike and mobility concepts. Lightweight power systems suitable for other aerospace applications are also developed.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> High Power System Technologies	31.000	39.602	38.640
<b>Description:</b> Develop integrated system architecture, controls, and component technologies to provide for the large amounts of electrical power needed, and concurrent thermal mitigation required, by current and future manned and unmanned systems.			
<b>FY 2024 Plans:</b> Complete development of system and component electrical power, electro-mechanical, and thermal technologies for high-power applications. Continue testing of subsystems hardware in conjunction with continued platform level tip-to-tail modeling and simulation for energy optimization. Continue medium-scale propulsion, power and thermal system studies and development to include innovative, integrated hybrid architectures. Continue development of advanced power and thermal capabilities for future hypersonic aircraft. Continue development of adaptive, affordable power and thermal technologies for emerging medium-scale platforms and mission capabilities. Initiate development of advanced vehicle energy management capabilities.			
<b>FY 2025 Plans:</b> - Continue testing of subsystems hardware in conjunction with continued platform level tip-to-tail modeling and simulation for energy optimization including update of Digital System Model for government subsystem architecture for autonomous collaborative platforms to provide sharable power and thermal model baseline for industry and government use. - Continue medium-scale propulsion, power and thermal system studies and development to include innovative, integrated hybrid architectures including medium scale vapor cycle systems to provide greater thermal capacity to autonomous collaborative platforms. - Continue development of advanced power and thermal capabilities for future hypersonic aircraft including power generation prototypes for high-temperature long-endurance missions to enable new platform capabilities.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 623145 / <i>Aerospace Power Technology</i>
--	---	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
<ul style="list-style-type: none"> <li>- Continue development of adaptive, affordable power and thermal technologies for emerging medium-scale platforms and mission capabilities including hardware-in-the-loop evaluation of electric flight control actuators to provide cost effective electric architectures and validated digital models.</li> <li>- Continue development of advanced vehicle energy management capabilities including modeling and analysis of path planning for energy management on autonomous collaborative platforms to provide benefits assessment, such as for extended range.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.962 million. Funding decreased due to decreased emphasis in high power system technologies.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	31.000	39.602	38.640

	FY 2023	FY 2024
<b>Congressional Add:</b> Emergency power and cooling thermal management growth <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts. This effort will be executed in Program 0602203F, Aerospace Propulsion, Project 623145, Aerospace Power Technology.	8.267	-
<b>Congressional Add:</b> Modular cooling capacity for tactical aircraft <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts. This effort will be executed in Program 0602203F, Aerospace Propulsion, Project 623145, Aerospace Power Technology.	3.477	-
<b>Congressional Add:</b> Program Increase - high mach turbine engine <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts.	9.754	-
<b>Congressional Add:</b> High voltage aircraft power <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts. This effort will be executed in Program 0602203F, Aerospace Propulsion, Project 623145, Aerospace Power Technology.	1.950	-
<b>Congressional Add:</b> Improving reliability of electrical systems for future aircraft <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts. This effort will be executed in Program 0602203F, Aerospace Propulsion, Project 623145, Aerospace Power Technology.	4.877	-
<b>Congressional Adds Subtotals</b>	28.325	-

**C. Other Program Funding Summary (\$ in Millions)**  
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force Date: March 2024

Appropriation/Budget Activity	R-1 Program Element (Number/Name)	Project (Number/Name)
3600 / 2	PE 0602203F / <i>Aerospace Propulsion</i>	623145 / <i>Aerospace Power Technology</i>

**C. Other Program Funding Summary (\$ in Millions)**

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602203F / Aerospace Propulsion				<b>Project (Number/Name)</b> 625171 / Missile Rocket Propulsion			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
625171: <i>Missile Rocket Propulsion</i>	-	35.991	39.233	36.945	0.000	36.945	37.788	38.558	41.808	42.646	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops rocket propulsion technologies for the design, development, and fabrication of strategic systems (including solid boost/missile motors, post boost control, aging and surveillance efforts), and tactical missiles. Analytical and experimental areas of emphasis are propellants, propellant management, combustion, rocket material applications, model-based system engineering, digital design of manufacture and test, test stand life-fire testing, and technology for sustainment of strategic systems. This project develops the next generation of physics-based modeling, simulation, and analysis (MS&A) tools for rapid and agile missile propulsion design, analysis, and production, as well as the digital engineering concepts to manage the entire process of design, test, and validation of solid rocket motors through live-fire tests. All efforts in this project contribute to the sustainment of the rocket propulsion industry, providing rocket propulsion technology for the entire Department of Defense (DoD). All efforts are reviewed by a DoD level steering committee yearly for relevance to DoD missions.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Missile Propellant Research	10.565	11.501	10.852
<b>Description:</b> Develop, characterize, and test advanced fuels, energetics, solid propellants, formulations, and their ingredients to increase missile launch vehicles and refine new synthesis methodologies. Development of propellant management devices in support of fabrication and fuel delivery.			
<b>FY 2024 Plans:</b> Continue to devise, synthesize, scale-up, and characterize novel energetic ingredients for monopropellants, fuels, and oxidizers, for use in DAF and missile applications including tactical, strategic, and in-space thrust and attitude control. Continue to formulate, scale-up, and evaluate formulations of solid and liquid rocket propellants, including green monopropellants. Continue to identify, evaluate, and adapt 21st century automated formulation and production techniques to enable more rapid and agile munitions production arrangements. Continue research in high- temperature resins, insulators, and composite case fabrication techniques to enable high performance rocket motor cases.			
<b>FY 2025 Plans:</b> - Continue to devise, synthesize, scale-up, test, and characterize novel energetic ingredients for monopropellants, fuels, and oxidizers, for use in DAF and missile applications including tactical and strategic applications. - Continue to formulate, scale-up, test, and evaluate formulations of solid and liquid rocket propellants, including green monopropellants. - Continue to identify, evaluate, and adapt 21st century automated formulation and production techniques to enable more rapid and agile munitions.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 625171 / <i>Missile Rocket Propulsion</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

- Continue research in high- temperature resins, insulators, and composite case fabrication techniques to enable high performance rocket motor cases.			
---	--	--	--

<p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.649 million. Funding decreased due to decreased emphasis in missile propellant research.</p>			
---	--	--	--

<b>Title:</b> Ballistic and Tactical Propulsion Technologies	25.426	27.732	26.093
--	--------	--------	--------

<p><b>Description:</b> Develop and demonstrate missile propulsion technologies for ballistic and tactical missile applications. Research develops digital design and test with novel manufacturing processes to support national defense needs for performance, effectiveness, and industrial manufacturing capability for missile propulsion</p>			
---	--	--	--

<p><b>FY 2024 Plans:</b> Continue to apply next generation of chemical and mechanical aging mechanism modeling, simulation, and analysis tools, sensor schemes and tools, to user needs and unique challenges. Continue to develop advanced tactical propulsion hardware and concepts. Continue development, evaluation, verification, and validation of next generation of physics-based modeling, simulation, and analysis tools for rapid and agile missile propulsion design, analysis, and production to include designs for 21st century material processing techniques and hardware. Continue to support advanced component technologies for missile propulsion applications for strategic and strike systems helping to ensure their long-term sustainment. Continue automated solid rocket motor production techniques and components to enable more rapid and agile munitions production and logistic support.</p>			
--	--	--	--

<p><b>FY 2025 Plans:</b> - Continue to apply next generation of chemical and mechanical aging mechanism modeling, simulation, and analysis tools, sensor schemes and tools, to user needs and unique challenges. - Continue to develop advanced tactical propulsion hardware and concepts. - Continue development, evaluation, verification, and validation of next generation of physics-based modeling, simulation, and analysis tools for rapid and agile missile propulsion design, analysis, and production to include designs for 21st century material processing techniques and hardware. - Continue to support advanced component technologies for missile propulsion applications for strategic and strike systems helping to ensure their long-term sustainment. - Continue automated solid rocket motor production techniques and components to enable more rapid and agile munitions production and logistic support.</p>			
--	--	--	--

<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>			
--	--	--	--



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 625171 / <i>Missile Rocket Propulsion</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
FY 2025 decreased compared to FY 2024 by \$1.639 million. Funding decreased due to decreased emphasis in ballistic and tactical propulsion technologies.			
<b>Accomplishments/Planned Programs Subtotals</b>	35.991	39.233	36.945

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force										Date: March 2024		
Appropriation/Budget Activity 3600 / 2					R-1 Program Element (Number/Name) PE 0602203F / Aerospace Propulsion				Project (Number/Name) 625330 / Aerospace Fuel Technology			
COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
625330: Aerospace Fuel Technology	-	8.449	9.016	8.985	0.000	8.985	9.189	9.376	10.015	10.218	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project evaluates fuels for advanced turbine engines, scramjets, detonation, and combined cycle engines. This project also considers fuel related concepts that can increase turbine engine operational reliability, durability, mission flexibility, energy efficiency, and performance while reducing weight, fuel consumption, and cost of ownership. Applications include autonomous collaborative platforms, munitions, and high-speed systems (to include hypersonics). Research areas of emphasis include evaluations of fuel properties and characteristics of traditional, specialty, and alternative fuels developed from unconventional sources.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<p><b>Title:</b> Alternative Fuels</p> <p><b>Description:</b> Investigate novel sustainable aviation fuels for engines, missiles, aircraft, sustained high-speed vehicles, hypersonic, and responsive space launch applications. Conduct evaluations and perform technical assessments of alternative fuels developed from unconventional sources for use in legacy and advanced aerospace systems. Support development of alternative fuel specification for commercial jet fuels with Federal Aviation Agency.</p> <p><b>FY 2024 Plans:</b> Complete development and continue investigation of novel sustainable and alternative aviation fuels and technologies for potential propulsion performance and logistical enhancements.</p> <p><b>FY 2025 Plans:</b> - Complete investigation of novel sustainable and alternative aviation fuels and technologies for potential propulsion performance and logistical enhancements.</p> <p>- Initiate research in developing tools to understand fuel composition, focusing on non-drop-in fuels.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable</p>	0.652	0.694	0.694
<p><b>Title:</b> Integrated Thermal and Energy Management</p> <p><b>Description:</b> Investigate and evaluate stability and performance of advanced and specialty fuels for air breathing propulsion systems.</p> <p><b>FY 2024 Plans:</b></p>	2.785	2.980	6.641

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 625330 / <i>Aerospace Fuel Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p>Continue the development and evaluation of novel fuel additives, catalysts, compositions, and system approaches enabling new hypersonic applications and expanding into other advance concepts and system-level impacts of emerging aviation technologies. Complete development of fuel related integrated thermal and energy management technologies including models for designs and evaluation of vehicle fuel systems, methods to monitor the fuel coking and other chemistry, and characterization methods for system-level impacts from thermally-stressed fuel, as well as expanding use as a thermal management fluid. Complete sensors to monitor the fuel chemistry that produces coke deposits and characterization of system-level impacts from thermally- stressed fuel. Complete evaluation of fuel reaction models that enable high temperature systems for evaluating advanced fuels including endothermic fuels. Continue investigation of fuel heat sink approaches for thermal management; Complete thermal management investigations of advanced engines and other systems that evaluate integrated power and thermal management approaches to include heat exchanger. Continue development of fuel models for system design and evaluation of fuel system. Continue development of sensors and analysis techniques for monitoring fuel chemistry that causes deposits. Continue developing integrated test rigs to tests these approaches and assess their efficiency.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete the development and evaluation of novel fuel additives, catalysts, compositions, and system approaches enabling new hypersonic applications and expanding into other advance concepts and system-level impacts of emerging aviation technologies.</li> <li>- Continue investigation of fuel heat sink approaches for thermal management; model fuel molecular interactions</li> <li>- Complete development of fuel models for system design and evaluation of fuel system.</li> <li>- Continue development of sensors and analysis techniques for monitoring fuel chemistry that causes deposits.</li> <li>- Complete development of integrated test rigs to tests these approaches and assess their efficiency.</li> <li>- Initiate development of fuel formulations for high-speed applications</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$3.661 million. Funding increased due to increased emphasis in fuel used for thermal management needed in high-speed applications.</p>			
---	--	--	--

<p><b>Title:</b> Fuel Logistics and Sustainment</p> <p><b>Description:</b> Study and evaluate low-cost approaches to reduce fuel logistics footprint to reduce cost. Study fuel logistics vulnerabilities and develop detection and mitigation technologies.</p> <p><b>FY 2024 Plans:</b> Continue support of fuel sustainment issues as needed, to understand current needs and problems as well as work to find solutions. Continue development of fuel compositional analyses methods that are verifiable across services and leverages a database of specification and extended compositional information to advance data visualization and analytics. Continue method developments to capture fuel stability limiters to minimize logistics vulnerabilities; develop detection and mitigations for fuel biocontamination to support logistics readiness; and develop fuel-sensing technologies with coordination and collaboration across</p>	2.796	2.980	1.580
--	-------	-------	-------

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 625330 / <i>Aerospace Fuel Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p>the government. Complete thermal stability studies (such as chemistry, fuel system, and hybrid developments), and technologies (such as additives, deoxygenation, and platform thermal stability sensors); and models and technologies developments for traditional, specialty, and sustainable aviation fuels under simulated current and future operational domain conditions to ensure Air Force's readiness. Complete to analyze and develop fuels, fuel blends, catalyst formulations, accessories, and models for operational requirement of hypersonic application and extending into other next generation applications and vehicles.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete support of fuel sustainment issues as needed, to understand current needs and problems as well as work to find solutions.</li> <li>- Complete development of fuel compositional analyses methods that are verifiable across services and leverages a database of specification and extended compositional information to advance data visualization and analytics.</li> <li>- Complete method developments to capture fuel stability limiters to minimize logistics vulnerabilities; develop detection and mitigations for fuel biocontamination to support logistics readiness; and develop fuel-sensing technologies with coordination and collaboration across the government.</li> <li>- Initiate research in converting military waste such as hydraulic fluids and engine oil to fuel or fuel components.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$1.400 million. Funding decreased due to decreased emphasis in fuel logistics and sustainment for existing aerospace systems.</p>			
--	--	--	--

<p><b>Title:</b> Combustion Emissions and Performance</p> <p><b>Description:</b> Develop and test applied emissions diagnostic techniques for air breathing propulsion systems. Evaluate aviation fuel for combustion and emissions characteristics and fuel composition performance impacts. Identify and develop approaches to improve system performance and emissions across different fuels and types.</p> <p><b>FY 2024 Plans:</b> Complete studies of impact on combustor performance and emissions based on fuel chemistry (traditional, specialty, and sustainable aviation fuels), and fuel entrance temperature well above historic use levels, and other operational impacts, such as high altitude. Complete development of low temperature catalyst augmented combustion technologies. Initiate studies of impact on combustor performance and emissions based on fuel chemistry of sustainable aviation fuels.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete studies of impact on combustor performance and emissions based on fuel chemistry of sustainable aviation fuels.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	2.216	2.362	0.070
---	-------	-------	-------

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602203F / <i>Aerospace Propulsion</i>	<b>Project (Number/Name)</b> 625330 / <i>Aerospace Fuel Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
FY 2025 decreased compared to FY 2024 by \$2.292 million. Funding decreased due to decreased emphasis in combustion emissions and performance for existing aerospace systems.			
<b>Accomplishments/Planned Programs Subtotals</b>	8.449	9.016	8.985

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force / BA 2: Applied Research	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / Aerospace Sensors
--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	249.300	216.269	193.029	0.000	193.029	193.065	199.897	218.538	222.759	Continuing	Continuing
622002: <i>Electronic Component Technology</i>	-	71.879	50.368	50.392	0.000	50.392	40.958	35.284	39.122	39.882	Continuing	Continuing
622003: <i>EO Sensors &amp; Countermeasures Tech</i>	-	26.870	26.838	25.965	0.000	25.965	26.525	26.725	29.216	29.785	Continuing	Continuing
622005: <i>Cyber Technology</i>	-	12.008	15.075	13.839	0.000	13.839	14.134	14.315	15.336	15.660	Continuing	Continuing
624920: <i>Electronic Warfare Technology</i>	-	43.391	41.944	40.981	0.000	40.981	41.878	42.209	46.231	47.140	Continuing	Continuing
626095: <i>Sensor Fusion Technology</i>	-	60.751	37.642	17.995	0.000	17.995	24.642	37.903	41.060	41.810	Continuing	Continuing
627622: <i>RF Sensors and Countermeasures Tech</i>	-	34.401	44.402	43.857	0.000	43.857	44.928	43.461	47.573	48.482	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops the technology base for Air Force aerospace sensors and electromagnetic combat. Advances in aerospace sensors are required to increase combat effectiveness by providing anytime, anywhere surveillance, reconnaissance, precision targeting, and electromagnetic warfare (EW) capabilities. To achieve this progress, this program pursues simultaneous advances in: 1) generating, controlling, receiving, and processing electronic and photonic signals for radio frequency (RF) sensor aerospace applications; 2) electro-optical (EO) and infrared (IR) aerospace sensor technologies for a variety of offensive and defensive uses; 3) radio frequency antennas and associated electronics for airborne and space surveillance, together with active and passive electro-optical/infrared sensors; 4) technologies to manage and fuse on-board sensor information for timely, comprehensive situational awareness; 5) technology for affordable, trusted, resilient, and reliable, all-weather surveillance, reconnaissance, and precision strike radio frequency sensors and electronic combat systems; and 6) technologies that aid in the development of agile and resilient mission systems. This program has been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

Funds in this program element may be used to investigate specified technology advancements in multiple domains.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>
---	--

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 the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	260.833	216.269	209.316	0.000	209.316
Current President's Budget	249.300	216.269	193.029	0.000	193.029
Total Adjustments	-11.533	0.000	-16.287	0.000	-16.287
• 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	-3.824	0.000			
• Other Adjustments	-7.709	0.000	-16.287	0.000	-16.287

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project: 622002: *Electronic Component Technology***

Congressional Add: *Program increase: low cost sensors for UAVs*

Congressional Add: *Program increase: Zero-trust environment for semiconductor technology*

Congressional Add: *Heterogeneous integration of microelectronics*

Congressional Add: *Field programmable gate arrays*

Congressional Add: *Reliability of combat cloud communications systems*

Congressional Add Subtotals for Project: 622002

**Project: 622005: *Cyber Technology***

Congressional Add: *Automated legacy code modernization*

Congressional Add Subtotals for Project: 622005

	<b>FY 2023</b>	<b>FY 2024</b>
	4.926	-
	9.853	-
	4.926	-
	6.897	-
	6.897	-
Congressional Add Subtotals for Project: 622002	33.499	-
	4.039	-
Congressional Add Subtotals for Project: 622005	4.039	-



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>
---	--

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 626095: *Sensor Fusion Technology*

Congressional Add: *Cyber kinetic combat environment*

Congressional Add Subtotals for Project: 626095

Congressional Add Totals for all Projects

	FY 2023	FY 2024
	29.556	-
	29.556	-
	67.094	-

**Change Summary Explanation**

Decrease in FY 2025 funding is due to re-prioritization to meet the nation's future security needs.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>				<b>Project (Number/Name)</b> 622002 / <i>Electronic Component Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622002: <i>Electronic Component Technology</i>	-	71.879	50.368	50.392	0.000	50.392	40.958	35.284	39.122	39.882	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project focuses on electronics and optoelectronics technologies that generate, control, receive, and process electromagnetic spectrum for aerospace sensor and electronic warfare applications. The enabling technologies developed under this project will be used for intelligence, surveillance, reconnaissance, electromagnetic warfare, battlespace access, and precision engagement capabilities. The technologies developed include exploratory electronic and optoelectronic devices, components, microsystems, and subsystems.

This project also assesses designs, develops, fabricates, and demonstrates the associated technologies for integrating combinations of these component technologies. The project demonstrates significantly smaller size, lower weight, lower cost, lower power dissipation, higher reliability, trustworthiness, and improved performance. The device and subsystem technology developments under this project are military unique; they are based on Department of the Air Force and other Department of Defense weapon systems requirements in the areas of radar, communications, electromagnetic warfare, positioning, navigation, timing, and smart weapons.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Sensor Subsystems	6.970	8.631	8.740
<b>Description:</b> Develop, analyze, demonstrate, and perform engineering trade studies for technologies for compact, affordable, multi-function subsystems for aerospace sensors.			
<b>FY 2024 Plans:</b> Continue research into autonomous low size, weight and power sensor processing. Continue research into digital at every element technology for multifunction microwave and millimeter wave arrays. Continue development of low size weight and power wideband multifunction radio frequency sensor subsystem suitable for Group 4 unmanned aircraft system operation. Continue millimeter wave digital array demonstrations. Continue wideband phased array emulation utilizing digital beamforming demonstrator. Initiate system build phase for multifunction wideband digital active electronically scanned array.			
<b>FY 2025 Plans:</b> - Continue research into autonomous low size, weight, and power sensor processing. - Continue research into digital at every element technology for multifunction microwave and millimeter wave arrays. - Continue development of low size weight and power wideband multifunction radio frequency sensor subsystem suitable for Group 4 uncrewed aircraft system operation. - Continue millimeter wave digital array demonstrations. - Continue wideband phased array emulation utilizing digital beamforming demonstrator.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 622002 / <i>Electronic Component Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
- Continue system build phase for multifunction wideband digital active electronically scanned array.				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$0.109 million. Justification for this increase is described in plans above.				
<b>Title:</b> Electronic Devices		6.306	8.411	8.427
<b>Description:</b> Assess, research, develop, demonstrate and transition revolutionary and evolutionary electronic devices and their associate technologies.				
<b>FY 2024 Plans:</b> Continue modeling efforts on integrated chip-level radio frequency device, power conversion modeling, and predictive analysis using higher order harmonics. Continue development of wide bandgap device and power conversion integration technologies. Continue demonstration of high efficiency microwave power modules with integrated high speed power conversion switching. Continue development of high frequency characterization capability and evaluation of next generation wide bandgap radio frequency materials.				
<b>FY 2025 Plans:</b> - Complete modeling efforts on integrated chip-level radio frequency device, power conversion modeling, and predictive analysis using higher order harmonics. - Continue development of wide bandgap device and power conversion integration technologies. - Continue demonstration of high efficiency microwave power modules with integrated high speed power conversion switching. - Continue development of high frequency characterization capability and evaluation of next generation wide bandgap radio frequency materials. - Initiate advanced wide-bandgap demonstration.				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$0.016 million. Justification for this increase is described in plans above.				
<b>Title:</b> Photonic Components and Circuits		6.796	9.550	9.500
<b>Description:</b> Research, develop, demonstrate and transition photonic, electro-optical, and infrared components for next generation intelligence, surveillance, reconnaissance and countermeasures.				
In FY 2025 this effort was renamed from Electro-Optical/Infrared (EO/IR) Components to Photonic Components and Circuits.				
<b>FY 2024 Plans:</b>				

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 622002 / <i>Electronic Component Technology</i>
--	--	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
<p>Continue photonic and quantum substructure technology development. Continue research into non-linear devices for tunability and power scaling. Continue development of high power, narrow line width lasers sources for advanced sensing and countermeasure applications. Continue laser component packaging for laser detection and ranging.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue photonic and quantum substructure technology development.</li> <li>- Continue research into non-linear devices for tunability and power scaling</li> <li>- Continue development of high power, narrow line width lasers sources for advanced sensing and countermeasure applications.</li> <li>- Continue laser component packaging for laser detection and ranging.</li> <li>- Initiate development of chip-scale photonic/electronic wideband transceiver components.</li> <li>- Initiate resilient and assured optoelectronic/infrared and photonic analysis.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.050 million. Justification for this decrease is described in plans above.</p>			
<p><b>Title:</b> Trusted and Assured Electronics</p> <p><b>Description:</b> Investigate and develop designs of resilient and assured electronic systems that enable revolutionary capabilities for the Department of the Air Force, assure operational mission systems, and impede unwanted technology transfer thus enabling timely adoption and integration of commercial solutions with government-off-the-shelf microelectronic technologies. Areas of development include: multi-function radio frequency and electro-optical subsystems, advanced electronic materials, on-board sensor processing, high-frequency power modules, and resilient, assured, and reliable electronics.</p> <p><b>FY 2024 Plans:</b> Continue development of prototype trustworthiness assessment capability. Continue reliability assessments of advanced heterogeneously integrated microsystems. Continue verification and validation of security techniques and methodologies for integrated circuit designs. Continue disaggregated multi chip System in Package demonstration using fine pitch for assurance. Initiate application of trust in design to digital engineering and virtual prototyping for assured design.</p> <p>In FY 2024 this effort was renamed from Trusted Electronics for Intelligence, Surveillance, Reconnaissance and Avionics Mission Systems to Trusted and Assured Electronics.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue development of prototype trustworthiness assessment capability and advanced exploitation tool development to assess modern threat capability.</li> <li>- Continue reliability assessments of advanced heterogeneously integrated microsystems.</li> <li>- Continue verification and validation of security techniques and methodologies for integrated circuit designs.</li> <li>- Continue disaggregated multi-chip System in Package demonstration using fine pitch for assurance.</li> </ul>	8.286	10.781	15.942

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / Aerospace Sensors	<b>Project (Number/Name)</b> 622002 / Electronic Component Technology		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Initiate application of digital engineering and virtual prototyping to develop resilience and assurance techniques for microelectronic designs.</p> <p>- Continue protective technology development for integration of commercial and government technologies for sensors and sensor systems to deter reverse engineering and exploitation of critical hardware and software to impede unwanted technology transfer, alteration of system capability, or development of countermeasures to our systems.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$5.161 million. This is a result of realignment of funding and technical work from Program Aerospace Sensors, 0602204F; Project Electronic Component Technology, 622002; Microelectronics &amp; Embedded System Assurance effort to this effort.</p>				
<p><b>Title:</b> Advanced Highly Integrated Microsystems for Intelligence, Surveillance, Reconnaissance and Electronic Warfare</p> <p><b>Description:</b> Perform research and development of electronic circuit and microsystem technologies focused on miniaturization, power reduction, reconfigurability and reduced cost.</p> <p><b>FY 2024 Plans:</b> Continue development of next generation reconfigurable transceiver. Continue development of microsystem integration solutions that integrate advanced components and thermal management technologies for cost, size, weight and power constrained microwave and millimeter wave applications. Continue development of chip-scale photonic/electronic wideband transceiver components. Continue development of high-Q passive components for heterogeneous integration. Continue identification of application areas and development of heterogeneous integration concepts.</p> <p><b>FY 2025 Plans:</b> - Complete development of next generation reconfigurable transceiver. - Continue development of chip-scale photonic/electronic wideband transceiver components. - Complete identification of application areas and development of heterogeneous integration concepts. - Continue development of microsystem integration solutions that integrate advanced components and thermal management technologies for cost, size, weight and power constrained microwave and millimeter wave applications.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$0.010 million. Justification for this increase is described in plans above.</p>		5.798	7.773	7.783
<p><b>Title:</b> Microelectronics &amp; Embedded System Assurance</p> <p><b>Description:</b> Investigate and develop microelectronics security technologies to impede unwanted technology transfer and enable timely adoption of commercial and government-off-the-shelf microelectronic technologies that enable revolutionary capabilities for the Air Force.</p>		4.224	5.222	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 622002 / <i>Electronic Component Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b><i>FY 2024 Plans:</i></b> Continue development of techniques to deter reverse engineering and exploitation of critical program information. Continue advanced exploitation tool development to assess modern threat capability. Initiate protective technology development for sensors and sensor systems. This may involve commercial and government technologies to deter reverse engineering and unwanted technology transfer, alteration of system capability, and prevent development of countermeasures.</p> <p><b><i>FY 2025 Plans:</i></b> In FY 2025 funding from this effort was realigned to Program Aerospace Sensors, 0602204F; Project Electronic Component Technology, 622002; Trusted and Assured Electronics effort.</p> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$5.222 million. This is a result of realignment of funding from this project to Program Aerospace Sensors, 0602204F; Project Electronic Component Technology, 622002; Trusted and Assured Electronics effort.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	38.380	50.368	50.392

	<b>FY 2023</b>	<b>FY 2024</b>
<b><i>Congressional Add:</i></b> Program increase: low cost sensors for UAVs	4.926	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressional directed efforts		
<b><i>Congressional Add:</i></b> Program increase: Zero-trust environment for semiconductor technology	9.853	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressional directed efforts		
<b><i>Congressional Add:</i></b> Heterogeneous integration of microelectronics	4.926	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressional directed efforts		
<b><i>Congressional Add:</i></b> Field programmable gate arrays	6.897	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressional directed efforts		
<b><i>Congressional Add:</i></b> Reliability of combat cloud communications systems	6.897	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressional directed efforts		
<b>Congressional Adds Subtotals</b>	33.499	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 622002 / <i>Electronic Component Technology</i>

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>				<b>Project (Number/Name)</b> 622003 / <i>EO Sensors &amp; Countermeasures Tech</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622003: <i>EO Sensors &amp; Countermeasures Tech</i>	-	26.870	26.838	25.965	0.000	25.965	26.525	26.725	29.216	29.785	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops advanced electro-optical aerospace sensor technologies for a variety of offensive and defensive applications. The sensor technologies under development cover the ultraviolet through the infrared portion of the spectrum. Technical efforts include improvements in system integration, digital processing, analysis tools, and sensor architectures. One of the project's goals is to improve electro-optical and related technologies for the detection, tracking, and identification of non-cooperative and difficult targets, such as those obscured by camouflage or operating at significant range. This project also develops the passive and active sensors and algorithms needed to enable precision targeting in challenging operating environments as well as advanced electro-optical threat warning and countermeasures technologies. These technologies are critical to future aerospace surveillance and targeting.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Passive Electro-Optical/Infrared Sensing in Contested Environments	13.153	12.960	12.248
<b>Description:</b> Develop innovative passive optical sensing technology to support surveillance, reconnaissance and targeting in contested environments. Develop high performance cameras, aperture technologies, novel sensing architectures, advanced exploitation, and imaging techniques capable of detection, tracking and identification of multi-domain threats.			
<b>FY 2024 Plans:</b> Continue development of advanced processing algorithms for hyperspectral imaging. Continue development of low-earth orbit sensing systems for critical Department of the Air Force needs, including event-based sensors and passive interferometry. Continue development of large format, long wave infrared detector array for infrared search and track in preparation for future testing. Continue development of low size, weight and power processor for infrared search and track.			
<b>FY 2025 Plans:</b> - Complete development of baseline advanced processing algorithms for hyperspectral imaging. Initiate development of thermal infrared hyperspectral technologies to enable day/night capability. - Complete development of multi-domain sensing systems for critical Department of the Air Force needs, including visible-band event-based sensors and passive interferometry. - Continue development of novel multi-domain sensing concepts, including infrared event-based sensors and motion target indicator technology. - Complete development of large format, long wave infrared detector array for infrared search and track and perform system testing. - Complete development of low size, weight and power processor for infrared search and track.			



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 622003 / <i>EO Sensors &amp; Countermeasures Tech</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
- Initiate development of low size, weight and power infrared search and track sensors.			
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$0.712 million. Justification for this decrease is described in plans above.			
<b><i>Title:</i></b> Laser Radar Sensing in Contested Environments  <b><i>Description:</i></b> Develop innovative laser sensing technology for non-cooperative identification and targeting of airborne and surface targets in contested environments. Develop optical spectrum transmitters, detectors, agile aperture and exploitation technologies capable of sensing multiple target characteristics for robust non-cooperative target identification.  <b><i>FY 2024 Plans:</i></b> Initiate multi-mode laser radar system demonstration for attritable platforms and benchmark model with collected data, including validation of data processing algorithms. Initiate effort to reduce size, weight, and power of laser radar systems. Continue development of processing software for multi-mode laser radar with a focus on processing efficiency. Initiate work on non-mechanical beam steering methods for optical apertures. Continue designing large aperture laser radar for high-resolution imaging needs, with a focus on improving performance post demonstration, while working with customers to investigate transition potential of existing designs.  <b><i>FY 2025 Plans:</i></b> - Complete multi-mode laser radar system demonstration and validation for attritable platforms. - Complete effort to reduce size, weight, and power of laser radar systems. - Continue development of processing software for multi-mode laser radar with a focus on processing efficiency. - Complete work on nonmechanical beam steering methods for optical apertures. - Complete designing large aperture laser radar for high-resolution imaging needs. - Initiate effort to improve performance, size, weight and power of laser radar components.  <b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$0.161 million. Justification for this increase is described in plans above.	13.717	13.878	13.717
<b>Accomplishments/Planned Programs Subtotals</b>	26.870	26.838	25.965

<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A <b>Remarks</b>
---

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 622003 / <i>EO Sensors &amp; Countermeasures Tech</i>

**D. Acquisition Strategy**  
Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>				<b>Project (Number/Name)</b> 622005 / <i>Cyber Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622005: <i>Cyber Technology</i>	-	12.008	15.075	13.839	0.000	13.839	14.134	14.315	15.336	15.660	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project focuses on technologies for enabling agile and resilient Air Force mission systems. This project improves our understanding of cyber vulnerabilities of mission systems by investigating the fundamental nature of those vulnerabilities including: how they come about, how they can be discovered, how they can be quantified and categorized, how they can be exploited, and how they can be removed or mitigated to secure the system. This project develops adaptable and resilient hardware/software for real-time avionics cyber-attack pattern recognition and develops a protection system with the capability for autonomous learning, adaptation, and self-protection. This project investigates open architecture concepts and technologies to deliver capability flexibility to Department of the Air Force mission systems. These technologies are matured via integrated capability demonstrations.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Flexible and Secure Avionics	7.969	15.075	13.839
<b>Description:</b> Develop avionics protection tools and capabilities to enable manned and unmanned aircraft, avionics, and related support equipment to automatically adapt to and withstand cyber attacks. Research and develop tools, methodologies and architecture guidelines that enable the design of avionics systems with sense, learn and adapt capabilities. Support test, maintenance, and acquisition communities with cyber subject matter expertise and techniques through consultation and technical interchange. Support other Services with cyber resiliency capabilities for air, ground and sea platforms and develop Open Mission Systems architectures incorporating cyber protections and resilience technologies.			
<b>FY 2024 Plans:</b> Continue investigation and development of techniques to enable resilient cyber protections for mission systems. Continue laboratory demonstrations on flight worthy hardware. Share expertise with other services and test, maintenance, and acquisition communities. Continue investigating protection technologies applied to open system architectures to enable resilience in next-generation mission systems and facilitate agility in mission system capability. Continue development of advanced modular architecture for agile avionics mission systems. Initiate investigation of model-based systems engineering applications to improve agility and resiliency of legacy and next-generation avionics mission systems architectures. Leverage models and open system architecture standards to quicken integration and transition of critical sensors technology.			
<b>FY 2025 Plans:</b> - Continue investigation and development of techniques to enable resilient cyber protections for mission systems. - Continue laboratory demonstrations on flight worthy hardware. - Share expertise with other services and test, maintenance, and acquisition communities. - Continue investigating protection technologies applied to open system architectures to enable resilience in next-generation mission systems and facilitate agility in mission system capability.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 622005 / <i>Cyber Technology</i>
--	--	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
<ul style="list-style-type: none"> <li>- Continue development of advanced modular architecture for agile avionics mission systems.</li> <li>- Continue investigation of model-based systems engineering applications to improve agility and resiliency of legacy and next-generation avionics mission systems architectures.</li> <li>- Continue to leverage models and open system architecture standards to quicken integration and transition of critical sensors technology.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 decreased compared to FY 2024 by \$1.236 million. Decrease is a result of decreased emphasis on the investigations into, and utility of, legacy avionics systems.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	7.969	15.075	13.839

	FY 2023	FY 2024
<b><i>Congressional Add:</i></b> Automated legacy code modernization	4.039	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressional directed efforts		
<b>Congressional Adds Subtotals</b>	4.039	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>				<b>Project (Number/Name)</b> 624920 / <i>Electronic Warfare Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
624920: <i>Electronic Warfare Technology</i>	-	43.391	41.944	40.981	0.000	40.981	41.878	42.209	46.231	47.140	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops and assesses affordable, reliable, all weather radio frequency countermeasure concepts for aerospace applications covering the range of radio frequency sensors including communications, navigation, intelligence, surveillance and reconnaissance (ISR), and radar, both active and passive, across the air, land, sea, space and cyber domains. It develops and evaluates technology for electronic warfare, integrated radar and electronic warfare systems, and electro-optical/infrared seeker defeat. This project develops the radio frequency warning and countermeasure technology for advanced electronic warfare and information operations applications. The project also explores technologies to maintain a military advantage in positioning, navigation and timing integrity, accuracy, and resiliency as well as on aircraft mission assurance - the protection of airborne platforms, manned and unmanned, in contested environments. The ultimate goal of the project is to ensure unrestricted access to the airspace and the electromagnetic spectrum in contested and congested environments.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Positioning, Navigation and Timing in Contested/Denied Environments	13.165	13.204	12.875
<b>Description:</b> Develop resilient positioning, navigation and timing science and technologies. Explore positioning, navigation and timing solutions to enable novel distributed radio frequency sensing and countermeasure techniques. Science and Technology being developed feed capabilities that overcome evolving positioning, navigation, and timing threats.			
<b>FY 2024 Plans:</b> Continue research and demonstrations of integrated positioning, navigation and timing alternatives to satellite navigation aiding of inertial measurement units. Such environmentally sensed alternatives include radio frequency signals of opportunity, magnetic gradient sensing, and sensor derived vision aiding. Continue developing technologies to support airborne precise time and frequency transfer in contested environments, to enable missions such as coherent sensing (intelligence, surveillance, reconnaissance), coherent effects (electromagnetic warfare), and operational concepts such as the Air Battle Management System. Continue developing and demonstrating trust techniques and operational concepts such as distribution of trusted satellite trajectories/information to enable blue force use of foreign satellite navigation signals. Continue research of software defined antenna electronics to complement software defined navigation receiver efforts. Continue to explore advanced algorithms for software defined navigation.			
<b>FY 2025 Plans:</b> - Continue research and demonstrations of integrated positioning, navigation, and timing alternatives of advanced satellite navigation user equipment and alternatives to satellite navigation; alternatives to satellite navigation include environmentally sensed magnetic gradient sensing & map generation, and sensor-derived vision aiding and wide-area vision position acquisition.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 624920 / <i>Electronic Warfare Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue developing technologies to support airborne precise time and frequency transfer in contested environments, to enable missions such as coherent sensing (intelligence, surveillance, reconnaissance), coherent effects (electromagnetic warfare), and operational concepts such as the Air Battle Management System.</li> <li>- Continue developing and demonstrating trust techniques and apply to Global Navigation Satellite System-based software defined receivers.</li> <li>- Continue research, and initiate development, of software defined antenna electronics; including implementation of advanced techniques on reference hardware.</li> <li>- Continue to explore advanced algorithms for software defined navigation.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.329 million. Justification for this decrease is described in plans above.</p>			
<p><b>Title:</b> Radio Frequency Electronic Warfare Technologies</p> <p><b>Description:</b> This project develops the radio frequency warning and countermeasure technology for advanced electromagnetic warfare and information operations applications. This project develops techniques and technologies to detect and counter the communications links and sensors of threat integrated air defense systems and hostile command and control networks.</p> <p><b>FY 2024 Plans:</b> Continue to develop, assess and mature radio frequency electromagnetic warfare technologies to identify, address, and reason about capabilities and intentions of complex emitters in contested environments. Expand specific threat identification to generalized techniques and logic, evolving traditional strategies towards adaptive capabilities that lead towards autonomous implementation for optimized response at tactically relevant timescale. Continue to develop and mature capabilities to defeat advanced radio frequency and multi-spectrum (integrated electro-optical and radio frequency) threats utilizing a common architecture that will feed into multiple advanced technology development programs. Initiate development of radio frequency environment signal based simulations that are moving towards a modular open systems approach. Continue to enhance and upgrade hardware in the loop assessment capabilities to keep pace with complex electromagnetic spectrum background environments and emerging threats. Continue robust modeling, simulation, and assessment capability, completing an effort looking at a particular advanced threat kill chain defeat concept.</p> <p><b>FY 2025 Plans:</b> - Continue to develop, assess, and mature radio frequency electromagnetic warfare technologies to identify, address, and reason about capabilities and intentions of complex emitters in contested environments; enhance generalized techniques and logic to strengthen adaptive capabilities that lead towards autonomous implementation for optimized response at tactically relevant timescale.</p>	23.554	22.089	21.587

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 624920 / <i>Electronic Warfare Technology</i>
--	--	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<ul style="list-style-type: none"> <li>- Continue to develop and mature capabilities to defeat advanced radio frequency and multi-spectrum (integrated electro-optical and radio frequency) threats utilizing a common architecture that will feed into multiple advanced technology development programs.</li> <li>- Continue development of radio frequency environment signal-based simulations utilizing a modular open systems approach.</li> <li>- Continue to enhance and upgrade hardware in the loop assessment capabilities to keep pace with complex electromagnetic spectrum background environments and emerging threats.</li> <li>- Continue robust modeling, simulation, and assessment capabilities to analyze and develop advanced threat kill web defeat concepts.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$0.502 million. Justification for this decrease is described in plans above.</p>			
---	--	--	--

<b><i>Title:</i></b> Electro-Optical/Infrared Threat Warning and Countermeasures Technologies	6.672	6.651	6.519
---	-------	-------	-------

***Description:*** Develop electro-optical/infrared sensor countermeasure technologies. Explore novel concepts to enable electro-optical/infrared threat seeker exploitation and surrogate modeling. Conduct fundamental research in countermeasures to defeat electro-optical/infrared threat seekers. Conduct fundamental research on integrated electro-optical/infrared threat warning systems.

***FY 2024 Plans:***

Continue protection of aircraft and aircrew against advanced electro-optical/infrared guided threats by developing new or improved threat detection and countermeasure techniques. Continue investigate long-range missile warning and develop laser warning technology concepts to improve aircraft and aircrew survivability. Continue to validate threat warning results and missile signature modeling using data collected in live fire tests. Continue developing the digital engineering ecosystem to create/improve countermeasure techniques and evaluate novel infrared countermeasures system concepts. Continue the perform verification and validation activities on digital twin models within this digital ecosystem by collecting data in static flight tests, laboratory measurement, and peer assessments. Continue development and usage of threat surrogates to gain technical knowledge of future and emerging threats. Continue development of digital engineering components for electro-optical/infrared/radio frequency multi-spectrum threat assessment.

***FY 2025 Plans:***

- Continue protection of aircraft and aircrew against advanced electro-optical/infrared guided threats by developing new or improved threat detection and countermeasure techniques.
- Continue investigation of long-range missile warning and develop laser warning technology concepts to improve aircraft and aircrew survivability.
- Continue to validate threat warning results and missile signature modeling using data collected in live-fire tests.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 624920 / <i>Electronic Warfare Technology</i>
--	--	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
<ul style="list-style-type: none"> <li>- Continue developing the digital engineering ecosystem to create/improve countermeasure techniques and evaluate novel infrared countermeasures system concepts.</li> <li>- Continue to perform verification and validation activities on digital twin models within this digital ecosystem by collecting data in static flight tests, laboratory measurements, and peer assessments.</li> <li>- Strengthen development and usage of threat surrogates to gain technical knowledge of future and emerging threats.</li> <li>- Continue development of digital engineering components to expand electro-optical and infrared models and information to enhance multi-spectrum threat assessment and develop advanced threat kill web defeat concepts.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$0.132 million. Justification for this decrease is described in plans above.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	43.391	41.944	40.981

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>				<b>Project (Number/Name)</b> 626095 / <i>Sensor Fusion Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
626095: <i>Sensor Fusion Technology</i>	-	60.751	37.642	17.995	0.000	17.995	24.642	37.903	41.060	41.810	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops foundational and applied technologies required for closed-loop autonomous sensing employing multiple information domains, diverse sensor phenomena, and multiple platform types to provide intelligence, surveillance, and reconnaissance; target recognition; situational awareness and battlespace visualization; fire control; and battle damage assessment capabilities against a wide variety of air and ground based targets engaged in multitudes of behaviors in a broad range of operational environments. This project conducts exploratory and applied investigations to determine technology feasibility and estimate operational capability constraints associated with missions in future contested and highly contested operating environments, using cooperative and non-cooperative sensing sources. This project develops techniques to automate multi-sensor exploitation and information processing which leverage data fusion, adaptive signal processing, sensor and platform orchestration, leveraging artificial intelligence / machine learning research communities. This project develops concepts and algorithms for efficient processing at the edge, parallel processing, distributed processing, and high-performance computing in sensor data processing and synthetic data generation.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Battlespace Awareness Sensing Fusion	14.757	18.912	9.033
<p><b>Description:</b> Develop novel techniques for behavioral and physical knowledge generation from multiple sensors, intelligence sources, domains and sources to include algorithm development, assessment, and experiments across multiple distributed, homogeneous and heterogeneous sensors and platforms. This effort will focus on technology areas of data association, entity detect/track/identification, information fusion, training with limited data, and data/performance modeling. The application of machine learning techniques to address technical challenges in contested environments is a particular emphasis.</p> <p><b>FY 2024 Plans:</b> Initiate a system of systems construct, bringing opportunistic sensing capabilities to tactical edge information integration. Continue generating knowledge through fusion of multiple spatial and temporal sensors, improving the state of the art in fusion exploitation. Continue to provide solutions for contested environments wherein data is extremely limited. Continue to apply novel state of the art deep and machine learning techniques to the recognition of stationary and moving objects in air/ground/surface based systems, pattern of life understanding, applying advanced information understanding tools and emerging techniques, over a broad set of sensing operating conditions. Continue advancing research techniques learned in air/space to ground application; where applicable expand sensing domain to include surface. Continue investigating fusion of hard and soft information sources for military relevant applications. Continue improving the time between development and demonstration of integration capabilities with a development, secure, operations and algorithm containerization. Initiate a research and development push to standardized</p>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 626095 / <i>Sensor Fusion Technology</i>
--	--	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p>integration environments and expand simulation capabilities to estimate performance across a wide spectrum of operating conditions.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue a system of systems construct utilizing the latest in DevSecOps and Open Mission Standards to generate capability at the tactical edge.</li> <li>- Continue to generate knowledge through multiple spatial and temporal sensing systems through improved information fusion.</li> <li>- Continue to research solutions in a train/test data limited environment.</li> <li>- Continue to leverage state of the art algorithm techniques leveraging artificial intelligence with deep learning and machine learning.</li> <li>- Continue to exploit stationary and moving objects of interest in multiple domains by way of pattern of life understanding, applying next-generation information understanding tools and emerging techniques, over a broad set of sensing operating conditions.</li> <li>- Continue to advance research in multi-domain sensing applied to air, ground and surface targets.</li> <li>- Continue to improve fusion of hard and soft information sources.</li> <li>- Continue to improve the amount of time required to move research from basic to applied to advanced demonstrations.</li> <li>- Continue to standardize integration environments, expand simulation capabilities and investigate model-based systems engineering best practices.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$9.879 million due to re-prioritization to meet the nation's future security needs.</p>			
---	--	--	--

<p><b>Title:</b> Multi-Domain Sensing Effects and Analysis</p> <p><b>Description:</b> This effort focuses on two primary areas: (1) Multi domain sensing and effects mission analysis and (2) performance understanding and assessments. It develops methodologies and modeling, simulation, and analysis tools to enable multi-domain analysis and technology development, informing other efforts and projects across the directorate. Investments in modeling, simulation and analysis represent current and next generation sensing platforms to include multiple domains. Technologies include: fusion of information, battlespace understanding, and the ability to simulate sensor and platform performance at the mission level, engagement level, and physics level, to understand performance and trade space amongst these domains.</p> <p><b>FY 2024 Plans:</b> Continue development of autonomy performance evaluation techniques adapted to specific artificial intelligence and machine learning challenges. Continue to perform empirical performance estimation for intelligence, surveillance, and reconnaissance automated sensing exploitation of military-critical targets with limited training data. Continue the employment of data as-a-service research environment across unclassified to classified networks, leveraging research cluster compute, cloud environments and high-performance compute facilities, further enabling sensing autonomy developers and warfighting analysts. Continue the transition to defense applications data tagging and automated data availability architecture to a service-wide application along</p>	3.192	3.948	1.871
---	-------	-------	-------

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 626095 / <i>Sensor Fusion Technology</i>
--	--	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
---	---------	---------	---------

<p>with our intelligence community partners. Continue the transition of test and evaluation harness software to department-wide performance analysis community, leveraging standardize test metrics and performance measurement understanding.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue development of performance evaluation techniques addressing both single-intelligence sensing systems as well as closed-loop systems-of-systems.</li> <li>- Continue to perform empirical performance measurements in addition to performance prediction estimates for automated/ autonomous intelligence, surveillance and reconnaissance exploitation systems of military-critical targets with limited train and test data.</li> <li>- Continue the employment of data-as-a-service research environment across unclassified and classified networks.</li> <li>- Continue to leverage cluster compute, cloud compute, and high-performance compute facilities to enable autonomy developers and warfighting analysts.</li> <li>- Continue to transition to defense applications, data tagging, automated data availability architecture in a service-wide application along with our intelligence community partners.</li> <li>- Continue the development of the test and evaluation test harness for department-wide evaluation analysis community leveraging standardized test metrics and performance measurement understanding.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$2.077 million due to re-prioritization to meet the nation's future security needs.</p>			
--	--	--	--

<p><b>Title:</b> Knowledge and Execution Management</p> <p><b>Description:</b> This effort focuses on Artificial Intelligence, Machine Learning, Machine Understanding, and Autonomous Decision Making. Develop, evaluate, and demonstrate models for sensing and models for adversary behavior that support anticipatory asset tasking, characterization of latencies and related uncertainties, and joint inference and control. Develop multisource sensing techniques to include sensor and platform optimization and control, providing environment characterization consistent with the needs of automated and autonomous systems. The goal of this research and development is to mature closed loop mission/ sensing autonomy and orchestration efforts.</p> <p><b>FY 2024 Plans:</b> Continue improving mission resource management techniques for distributed sensing/effects capabilities through open autonomy architectures and state of the art AI/ML techniques. Initiate applied research in direct support of systems of systems programs. Continue to accomplish performance understanding through simulation, demonstration, and blended simulation/live testing (multiple vehicles &amp; sensors). Continue improving representational and computational efficiency of on-board reasoning about ground/surface targets and target groupings, and target behaviors. Continue research in foundational knowledge of emerging management algorithms for battlespace awareness incorporating interacting air/ground targets, air/air targets, and air/surface</p>	10.420	10.371	4.986
---	--------	--------	-------

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 626095 / <i>Sensor Fusion Technology</i>
--	--	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p>environments, and operationally representative contingencies. Continue the development of emerging algorithms to perform information reasoning and continue to evolve forms of representations and combined representations and reasoning approaches.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue applying research to autonomy techniques for mission resource management, command &amp; control, sense making, resource planning, and mission orchestration.</li> <li>- Continue applied research in direct support of systems of systems programs.</li> <li>- Continue to accomplish performance understanding through simulation, demonstration, and blended simulation/live testing (multiple vehicles &amp; sensors).</li> <li>- Continue expanding the capabilities and scope of computational efficiency of on-board reasoning for tactical-edge Sensing Autonomy beyond specific high value airborne targets to improve prosecution of a broader set of air and surface targets.</li> <li>- Continue research in foundational knowledge of management algorithms for battlespace awareness incorporating interacting air/ground targets, air/air targets, and air/surface environments, and operationally representative contingencies.</li> <li>- Continue investigations of algorithms to perform information reasoning and continue to evolve forms of representations and combined representations and reasoning approaches.</li> <li>- Initiate investigation of lightweight, low power computational methods for edge computing solutions; to include neural emulation, cognitive processing, and machine learning techniques.</li> <li>- Initiate further applied research on the algorithmic tracking of multiple interacting targets across domains, environments, and operationally relevant contingencies.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$5.385 million due to re-prioritization to meet the nation's future security needs.</p>			
---	--	--	--

<p><b>Title:</b> Cyber Physical Sensing</p> <p><b>Description:</b> Cyber Physical Sensing is the opportunity to exploit the internet of things and other non-traditional intelligence, surveillance and reconnaissance sensing systems in a way other than what they were designed to do. This additional source of information closes the gap between current intelligence, surveillance and reconnaissance collection capabilities and the vision of all intelligence, surveillance and reconnaissance, all the time. This technology investment looks at the sensing opportunities which exist at the point where physics meets the cyber domain. This effort focuses on the proliferated sensing devices, extracting information from multi-intelligence sensors and translating that information into detection, tracking and identification by use of multi-intelligence fusion. This effort leverages processing at-the-edge and distributed processing, exploited using new-generation machine learning, artificial intelligence and deep learning techniques.</p> <p><b>FY 2024 Plans:</b> Continue research of non-traditional intelligence, surveillance and reconnaissance collection opportunities, associate opportunities to intelligence, surveillance and reconnaissance collection capabilities, and invest appropriately in research and development</p>	2.826	4.411	2.105
---	-------	-------	-------

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 626095 / <i>Sensor Fusion Technology</i>
--	--	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
<p>of techniques to improve collection, processing, and dissemination of information, allowing for automation and autonomy. Continue research and development in edge to core/cloud. Initiate science and technology investment of cyber physical sensing capabilities into systems of systems information flows, bringing opportunistic/non-traditional/proliferated sensing products into Air Force integrated capability intelligence, surveillance and reconnaissance exploitation programs. Continue research in new novel techniques to exploit unforeseen information from these non-traditional ISR information sources. Continue research which advances tactics, techniques, and procedures by way of new exploitation techniques of cyber physical modalities.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue research in non-traditional intelligence, surveillance and reconnaissance collection and exploitation opportunities; understand through performance evaluation and estimation where the best return on investment opportunities in non-traditional collection are.</li> <li>- Continue improv collection, processing and dissemination of intelligence, allowing for automation and autonomy.</li> <li>- Continue research and development at the edge and edge-to-core/cloud.</li> <li>- Continue research in cyber-physical sensing capabilities through system of system information flows.</li> <li>- Continue investigating transition opportunistic/non-traditional/proliferated sensing products into Department of the Air Force integrated capability programs.</li> <li>- Continue research in new novel techniques to exploit unforeseen information from these non-traditional information sources.</li> <li>- Continue research and development for the advancement of tactics, techniques, and procedures by way of new cyber-physical modalities.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$2.306 million due to re-prioritization to meet the nation's future security needs.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	31.195	37.642	17.995

	FY 2023	FY 2024
<b>Congressional Add:</b> Cyber kinetic combat environment	29.556	-
<b>FY 2023 Accomplishments:</b> Conduct Congressional directed efforts		
<b>Congressional Adds Subtotals</b>	29.556	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>				<b>Project (Number/Name)</b> 627622 / <i>RF Sensors and Countermeasures Tech</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
627622: <i>RF Sensors and Countermeasures Tech</i>	-	34.401	44.402	43.857	0.000	43.857	44.928	43.461	47.573	48.482	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project develops and assesses affordable, reliable all weather radio frequency sensing and countermeasure concepts for aerospace applications covering the range of radio frequency sensors including communications, navigation, intelligence, surveillance and reconnaissance, and radar, both active and passive, across multiple domains. This project also develops and evaluates technology for intelligence, surveillance and reconnaissance sensors, fire control radars, electromagnetic warfare, integrated radar and electromagnetic warfare systems, and offensive information operations systems. It emphasizes the detection and tracking of surface and airborne targets with radio frequency signatures that are difficult to detect due to reduced radar cross sections, concealment and camouflage measures, severe clutter, or heavy jamming. Techniques exploited include the use of multiple radio frequency phenomenologies, multi-dimensional adaptive processing, advanced waveforms and knowledge-aided processing techniques. This project also develops concepts to counter threats to our aerospace systems. It develops and evaluates technology for electromagnetic warfare, integrated radar and electromagnetic warfare systems, and electro-optical/infrared seeker defeat. This project develops the radio frequency warning and countermeasure technology for advanced electronic warfare and information operations applications. The project also explores technologies to maintain a military advantage in positioning, navigation and timing integrity, accuracy, and resiliency.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Multiband Multifunction Radio Frequency Sensing	13.660	14.976	14.741
<b>Description:</b> Develop multi-band and multi-beam forming technologies. Address technologies for antenna array operations in dynamic sensor networks.			
<b>FY 2024 Plans:</b> Complete demonstrations of integrated electronic support measure/airborne moving target indicator/ground moving target indicator modes for passive multi-mode radar using ultra high frequency to S-band digital array demonstrator. Continue advanced mode development for multi-beam and multi-function digital arrays, implementing more complex modes and advanced waveforms with applications for Advanced Early Warning radar. Complete transition of ground-based modes to laboratory experimental airborne digital array system. Initiate migration of mode implementation from custom interfaces to Department of Defense and Department of the Air Force standardized interfaces. Continue integration of additively manufactured antennas and radar backend components to demonstrate low-cost, wide bandwidth, scalable, and conformal phased array antennas for unmanned sensing platforms. Initiate analysis identifying performance bounds and requirements for low-cost radio frequency sensors in selected mission scenarios. Continue development of techniques for analysis of complex active electronically scanned arrays on large platforms.			
<b>FY 2025 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 627622 / <i>RF Sensors and Countermeasures Tech</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue advanced mode development for multi-beam and multi-function digital arrays, implementing more complex modes and advanced waveforms with applications for Advanced Early Warning radar.</li> <li>- Continue migration of mode implementation from custom interfaces to Department of Defense and Department of the Air Force standardized interfaces.</li> <li>- Initiate development of modes using standardized interfaces and utilizing hardware architectures representative of emerging Department of the Air Force systems.</li> <li>- Continue integration of additively manufactured antennas and radar backend components to demonstrate low-cost, wide bandwidth, scalable, and conformal phased array antennas for uncrewed sensing platforms.</li> <li>- Continue analysis identifying performance bounds and requirements for low-cost radio frequency sensors in selected mission scenarios.</li> <li>- Continue development of techniques for analysis of complex active electronically scanned arrays on large platforms.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.235 million. Justification for this decrease is described in plans above.</p>			
<p><b>Title:</b> Passive Radio Frequency Sensing</p> <p><b>Description:</b> Develop a system that performs traditional radar sensing modes through passive means. The research plan is designed to continue the development of the subsystems which make up the passive radar and to follow a spiral development path that involves the integration and testing of various technology instantiations to produce alternate versions of a full passive multi-mode system. Includes the development of low size-weight-and-power radio frequency signal detection and geolocation payloads for small uncrewed air systems and the integration of advanced receiver subsystems to meet a particular need of the Department of the Air Force. Explore combat identification technologies, modeling and simulation enhancements, and technologies supporting passive radar, electronic support, and signals intelligence.</p> <p><b>FY 2024 Plans:</b> Continue development of small low cost direction finding payloads and advanced processing techniques for onboard signal characterization, geolocation/track, and signals pattern-of-life analysis. Continue demonstrating distributed multi-ship geolocation aboard an expanded set of small unmanned aircraft systems responsive to user requirements. Continue development of enhanced radio frequency modeling and simulation tools for evaluation of passive radar performance in complex environments. Expand clutter modelling capability by incorporating sea clutter models from the Navy into the Air Force analysis tools to support performance and mission modeling including maritime targets. Continue integrating high fidelity modeling and simulation with mission level modeling to demonstrate operational utility of passive radar concepts. Continue analysis of bi-static target/ground scattering phenomenology and bi-static high resolution radar data in conjunction with advanced automated target recognition algorithms to demonstrate improved accuracy and timeliness for combat identification of complex targets. Continue</p>	8.677	15.071	14.759

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 627622 / <i>RF Sensors and Countermeasures Tech</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>the investigation of advanced processing techniques to enhance passive radar performance and enhance target ID performance. Initiate investigation of emerging receiver technology such as quantum enabled receivers.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue development of small low-cost direction-finding payloads and advanced processing techniques for onboard signal characterization, geolocation/track, and signals pattern-of-life analysis.</li> <li>- Continue demonstrating distributed multi-ship geolocation aboard an expanded set of small uncrewed aircraft systems responsive to user requirements.</li> <li>- Continue development of enhanced radio frequency modeling and simulation tools for evaluation of passive radar performance in complex environments.</li> <li>- Continue enhancement of clutter modelling capability by incorporating sea clutter models from the Navy into the Department of the Air Force analysis tools to support performance and mission modeling including maritime targets.</li> <li>- Continue integrating high-fidelity modeling and simulation with mission level modeling to demonstrate operational utility of passive radar concepts.</li> <li>- Initiate study of analysis tools and architectures in order to improve re-use across the Department of the Air Force research community.</li> <li>- Continue analysis of bi-static target/ground scattering phenomenology and bi-static high resolution radar data in conjunction with advanced automated target recognition algorithms to demonstrate improved accuracy and timeliness for combat identification of complex targets.</li> <li>- Continue the investigation of advanced processing techniques to enhance passive radar performance and enhance target ID performance.</li> <li>- Continue investigation of emerging receiver technology such as quantum enabled receivers.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.312 million. Justification for this decrease is described in plans above.</p>			
<p><b>Title:</b> Distributed Radio Frequency Sensing</p> <p><b>Description:</b> Develop innovative, timely, and affordable target detection, tracking, and characterization (namely imaging/identification) capabilities that leverage two or more spatially-distributed receivers and transmitters that use cooperative radio frequency transmitters (illuminators), namely those radio frequency sources that have a common objective to the receiver systems being used.</p> <p><b>FY 2024 Plans:</b> Continue development of robust non-traditional multi-static transmit waveforms and receive processing chains for operationally relevant multi-static ground moving target indicator systems. Continue investigation of platform constraints and implementations</p>	12.064	14.355	14.357



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602204F / <i>Aerospace Sensors</i>	<b>Project (Number/Name)</b> 627622 / <i>RF Sensors and Countermeasures Tech</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>of near real-time processing. Provide required technology enhancements to capstone flight experiment demonstrating multi-static detection and tracking of ground targets. Continue enhancements of multi-static synthetic aperture radar algorithms to support combat identification and automatic target recognition requirements on tactical timelines. Continue implementation and demonstration of multi-static synthetic aperture radar algorithms on cost and size constrained platforms. Continue development/maturation of distributed 3-dimensional imaging algorithms that are scalable to a multi-domain approach. Continue data collection and analysis to assess performance of distributed radar systems for ground moving target indicator and synthetic aperture radar. Continue to explore multi- and cross-domain applications.</p> <p><b><i>FY 2025 Plans:</i></b></p> <ul style="list-style-type: none"> <li>- Continue development of multi-static transmit waveforms and receive processing chains for multi-static ground moving target indicator concepts.</li> <li>- Continue investigation of potential platform constraints.</li> <li>- Continue enhancements of multi-static synthetic aperture radar algorithms to support combat identification and automatic target recognition requirements on tactical timelines.</li> <li>- Complete implementation and demonstration of multi-static synthetic aperture radar algorithms on cost and size constrained platforms.</li> <li>- Complete development/maturation of distributed 3-dimensional imaging algorithms that are scalable to a multi-domain approach.</li> <li>- Continue data collection and analysis to assess distributed radar concepts for ground moving target indicator and synthetic aperture radar.</li> <li>- Continue to explore multi- and cross-domain applications.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 increased compared to FY 2024 by \$0.002 million. Justification for this decrease is described in plans above.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	34.401	44.402	43.857

**C. Other Program Funding Summary (\$ in Millions)**  
N/A

**Remarks**

**D. Acquisition Strategy**  
Not applicable

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602212F / <i>Defense Laboratories R&amp;D Projects (10 U.S.C, Sec 2358)</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	107.281	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	107.281
622030: <i>Defense Lab R&amp;D Projects</i>	-	107.281	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	107.281

**A. Mission Description and Budget Item Justification**

Implementation of 10 U.S.C. Section 2363, amendment to PL 110-417, 10 U.S.C. Section 2358 and 10 U.S.C. 2805(d)(1)(B), to fund: innovative basic and applied research conducted at the defense laboratory and supports military missions; development programs supporting the transition of technologies developed by the defense laboratory into operational use; workforce development activities improving the capacity of the defense laboratory to recruit and retain personnel with necessary scientific and engineering expertise that support military missions; and the repair or minor military construction of the laboratory infrastructure and equipment.

The Air Force is dependent on technological advances in response to emerging threats and to maintain a competitive advantage. Air Force has a comprehensive and deliberative planning process to identify and fund research that is expected to have the greatest benefit to the Air Force and the warfighter. 10 U.S.C. Section 2363 provides the Commander of the Air Force Research Laboratory (AFRL), in consultation with the Air Force Science and Technology (S&T) Executive, a degree of flexibility to rapidly exploit scientific breakthroughs or respond to emerging threats, to include developing a skilled workforce and necessary infrastructure. This flexibility increases the rate of innovation and accelerates the development and fielding of needed military capabilities to address current and future problems.

The Air Force has established PE 0602212F, where the 10 U.S.C. Section 2363 funds are internally reprogrammed to this program element in the year of execution after receipt of the appropriation. This allows increased transparency to Congress on 10 U.S.C. Section 2363 funding and additional execution flexibility for 10 U.S.C. Section 2363 activities to cross all technology areas.

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.

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 2: Applied Research	<b>R-1 Program Element (Number/Name)</b> PE 0602212F I Defense Laboratories R&D Projects (10 U.S.C, Sec 2358)
--	--

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	107.281	0.000	0.000	0.000	0.000
Total Adjustments	107.281	0.000	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	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	107.281	0.000	0.000	0.000	0.000

**Change Summary Explanation**

Increase in FY 2023 in Other Adjustments is due to realignment of funds to PE 0602212F to support Research and Development Projects, 10 U.S.C. Section 2358, as amended by 10 U.S.C. 2805(d)(1)(B) and 10 U.S.C. Section 2363.

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Defense Laboratories R&D Projects - Air Force Research Laboratory	107.281	-	-
<b>Description:</b> Implementation of 10 U.S.C. Section 2363, amendment to PL 110-417, 10 U.S.C. Section 2358 and 10 U.S.C. 2805(d)(1)(B), to fund: innovative basic and applied research conducted at the Air Force Research Laboratory (AFRL) and supports military missions; development programs supporting the transition of technologies developed by AFRL into operational use; workforce development activities improving the capacity of AFRL to recruit and retain personnel with necessary scientific and engineering expertise that support military missions; and the repair or minor military construction of the laboratory infrastructure and equipment.			
<b>Accomplishments/Planned Programs Subtotals</b>	107.281	-	-

**D. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602298F / <i>Science and Technology Management - Major Headquarters Activities</i>
---	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	8.856	10.303	9.662	0.000	9.662	9.840	10.039	11.507	11.725	Continuing	Continuing
622520: <i>Science and Technology Management - Major HQ</i>	-	8.856	10.303	9.662	0.000	9.662	9.840	10.039	11.507	11.725	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Air Force Research Laboratory (AFRL) is a global technical enterprise, boasting some of the best and brightest leaders in the world. It provides revolutionary, relevant, and responsive science and technology (S&T) to the Warfighter. AFRL's mission is to lead the discovery, development, and integration of affordable warfighting technologies for the global air, space, and cyberspace force.

This program element includes 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 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, and 1206601SF.

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	8.856	10.303	9.402	0.000	9.402
Current President's Budget	8.856	10.303	9.662	0.000	9.662
Total Adjustments	0.000	0.000	0.260	0.000	0.260
• 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	0.260	0.000	0.260

**Change Summary Explanation**

FY25 increase to reflect inflation.

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602298F / <i>Science and Technology Management - Major Headquarters Activities</i>	<b>Project (Number/Name)</b> 622520 / <i>Science and Technology Management - Major HQ</i>
--	--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
622520: <i>Science and Technology Management - Major HQ</i>	-	8.856	10.303	9.662	0.000	9.662	9.840	10.039	11.507	11.725	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Air Force Research Laboratory (AFRL) is a global technical enterprise, boasting some of the best and brightest leaders in the world. It provides revolutionary, relevant, and responsive science and technology (S&T) to the Warfighter. AFRL's mission is to lead the discovery, development, and integration of affordable warfighting technologies for the global air, space, and cyberspace force.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<b>Title:</b> AFRL - Major Headquarters Activities	8.856	10.303	9.662
<b>Description:</b> Provide professional government civilian workforce in support of all AFRL programs and activities.			
<b>FY 2024 Plans:</b> Continue to provide professional government civilian workforce in support of all AFRL programs and activities.			
<b>FY 2025 Plans:</b> Continue to provide professional government civilian workforce in support of all AFRL programs and activities.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$.641 million due to a civilian pay reprice applied to FY24 only.			
<b>Accomplishments/Planned Programs Subtotals</b>	8.856	10.303	9.662

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	136.169	160.599	138.497	0.000	138.497	132.450	154.632	168.643	167.026	Continuing	Continuing
622068: <i>Advanced Guidance Technology</i>	-	70.788	88.179	72.734	0.000	72.734	68.640	89.308	99.660	96.656	Continuing	Continuing
622502: <i>Ordnance Technology</i>	-	65.381	72.420	65.763	0.000	65.763	63.810	65.324	68.983	70.370	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program investigates, develops, and establishes the technical feasibility and military utility of guidance and ordnance technologies for conventional munitions. The effort supports core technical competencies of munitions aerodynamics, guidance, navigation, and control; terminal seeker sciences; fuze technology; energetic materials; damage mechanisms; and munition systems effects. Technologies and associated models and simulation assets to be developed include seekers that provide high-confidence target discrimination and classification with precise target location and robust terminal tracking; navigation technologies that do not rely upon the Global Positioning System (GPS); blast, fragmentation, penetrating, low-collateral-damage, and multi-mission warheads; collaborative, synchronized fuzing; and high-performance and insensitive explosives.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of such program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602605F, 0602788F, 0602298F, and 0602020F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>
---	---

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	144.303	160.599	155.407	0.000	155.407
Current President's Budget	136.169	160.599	138.497	0.000	138.497
Total Adjustments	-8.134	0.000	-16.910	0.000	-16.910
• 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	-2.641	0.000			
• Other Adjustments	-5.493	0.000	-16.910	0.000	-16.910

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 622502: *Ordnance Technology*

Congressional Add: *Convergence technology research*

Congressional Add Subtotals for Project: 622502

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	9.817	-
	9.817	-
	9.817	-

**Change Summary Explanation**

Decrease in FY 2025 funding of 18.282 million due to Air Force funding re-prioritization.

Increase in FY 2025 funding of 0.070 million due to Civpay raise assumptions and non-pay/non-fuel purchase inflation rate adjustment.

Increase in FY 2025 funding of 1.226 million due to Civpay reprice adjustment.



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>				<b>Project (Number/Name)</b> 622068 / <i>Advanced Guidance Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622068: <i>Advanced Guidance Technology</i>	-	70.788	88.179	72.734	0.000	72.734	68.640	89.308	99.660	96.656	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project investigates, develops, and evaluates conventional munitions guidance technologies to establish technical feasibility and military utility of innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation. Project payoffs include adverse-weather, Global Positioning System (GPS)-degraded and Global Positioning System-denied, networked, and autonomous precision munition guidance capability; increased number of kills per sortie; increased aerospace vehicle survivability; improved weapon reliability and affordability; and improved weapon survivability and effectiveness.

**B. Accomplishments/Planned Programs (\$ in Millions)**

<p><b>Title:</b> Seeker Technologies</p> <p><b>Description:</b> Develops seeker technologies for munitions to provide high-confidence target discrimination and classification, precise target location, and robust terminal tracking.</p> <p><b>FY 2024 Plans:</b> Continue emphasizing technology development of multi-function sensors, rapid data compression for targeting, bio-inspired information processing and data fusion, and low-power computation. Continue developing technologies that simplify, increase flexibility, and reduce the cost of advanced seeker concepts. Continue to develop algorithmic approaches integrating weapons into the kill chain to enable distributive, flexible seeker targeting with or without an operator in the loop. Continue seeker algorithm development, modeling, simulation, and testing of innovative engagements against fifth-generation threat aircraft. Continue development of weapon radomes and apertures to improve transmission and optical performance while increasing protection from operational environments including directed energy and rain. Complete incorporation of open architecture principles to reduce cost and enable technology refresh within seeker sub-systems. Continue exploring specific techniques for seeker cost reduction with performance improvement such as sparse sensing and compressive sensing. Continue research on integrated processing techniques to enable networked systems. Continue multi-function radio frequency technique development to enable coherent multi-weapon operation. Complete development of weapon open system architecture with extended view and integration into weapon mission computer to enable cooperative weapon operation. Continue open seeker architecture integration into the weapon open system architecture and evaluate the impact with respect to cyber vulnerability. Continue development and demonstration of coherent collaborative radio frequency seeker operation.</p> <p><b>FY 2025 Plans:</b> - Continue emphasizing technology development of multi-function sensors, biology-inspired information processing and data fusion, and low-power computation. - Continue developing technologies that simplify, increase flexibility, and reduce the cost of advanced seeker concepts.</p>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
	13.608	17.675	14.579

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>	<b>Project (Number/Name)</b> 622068 / <i>Advanced Guidance Technology</i>
--	---	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<ul style="list-style-type: none"> <li>- Continue to develop algorithmic approaches integrating weapons into the kill chain to enable distributive, flexible seeker targeting with or without an operator in the loop.</li> <li>- Continue seeker algorithm development, modeling, simulation, and testing of innovative engagements against fifth-generation threat aircraft.</li> <li>- Continue development of weapon radomes and apertures to improve transmission and optical performance while increasing protection from severe operational environments.</li> <li>- Continue exploring specific techniques for seeker cost reduction with performance improvement such as sparse sensing and compressive sensing.</li> <li>- Continue research on integrated processing techniques to enable networked systems.</li> <li>- Continue and expand research into multi-function radio frequency (RF) system development for multiple RF applications on weapons as well as to enable novel coherent RF multi-weapon functions.</li> <li>- Continue open seeker architecture integration into the weapon open system architecture and evaluate the impact with respect to cyber vulnerability.</li> <li>- Continue development and demonstration of coherent collaborative radio frequency seeker operation.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$3.096 million for Seeker Technologies is due to Air Force funding re-prioritization.</p>			
--	--	--	--

<b>Title:</b> Aerodynamics, Navigation, and Control Technologies	32.288	39.535	32.610
--	--------	--------	--------

**Description:** Develops weapon aerodynamic control, navigation, and networking technologies for munitions to provide precise, agile flight, networked effects, and immunity to countermeasures.

**FY 2024 Plans:**  
Continue novel position, navigation and timing technology development for global positioning system denied environments with intent to insert into demonstration programs. Continue investigation of cooperative, autonomous, and collaborative weapon behaviors to develop robust algorithms and swarming play-books. Continue experiments demonstrating precision navigation, emphasizing cruise missile, form-factored optics and tracker for celestial-aided navigation at supersonic cruise missile speeds and trajectory. Continue flight testing of articulating head missile at supersonic speeds at full scale to include analysis of range extension through airframe morphing and articulation. Continue kinetic and electronic attack swarm plays incorporating cyber domain, electronic warfare, and kinetic effects. Continue flight demonstration of network-aided navigation autonomy play-book. Complete flight demonstration of high-speed, high-performance weaponized quad-rotor in a complex environment in support of autonomy tactics development and maturation. Continue machine learning to develop tactics for multi-weapon engagements. Continue synthetic aperture radar-based alternative-navigation technology investigation. Continue post-weapon deployment data analytics to improve guidance, navigation, and controls models and autonomy tactics.

**FY 2025 Plans:**

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>	<b>Project (Number/Name)</b> 622068 / <i>Advanced Guidance Technology</i>
--	---	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<ul style="list-style-type: none"> <li>- Continue novel position, navigation and timing technology development for global positioning system denied environments with intent to insert into demonstration programs.</li> <li>- Continue investigation of cooperative, autonomous, and collaborative weapon behaviors to develop robust algorithms and swarming play-books.</li> <li>- Continue experiments demonstrating precision navigation, emphasizing cruise missile, form-factored optics and tracker for celestial-aided navigation at supersonic cruise missile speeds and trajectory.</li> <li>- Continue flight testing of articulating head missile at supersonic speeds at full scale to include analysis of range extension through airframe morphing and articulation.</li> <li>- Continue kinetic and electronic attack swarm plays incorporating cyber domain, electronic warfare, and kinetic effects.</li> <li>- Continue flight demonstration of network-aided navigation autonomy play-book.</li> <li>- Continue machine learning to develop tactics for multi-weapon engagements.</li> <li>- Continue synthetic aperture radar-based alternative-navigation technology investigation.</li> <li>- Continue post-weapon deployment data analytics to improve guidance, navigation, and controls models and autonomy tactics.</li> <li>- Initiate flight demonstration of networked collaborative autonomy plays and tactics for survivability and lethality in contested environments.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$6.925 million for Aerodynamics, Navigation and Control Technologies is due to Air Force funding re-prioritization.</p>			
--	--	--	--

<p><b>Title:</b> Guidance Technologies</p> <p><b>Description:</b> Develops guidance subsystem integration and evaluation technologies to provide open and closed-loop ground testing, flight test risk reduction, and digital simulation of novel concepts.</p> <p><b>FY 2024 Plans:</b> Continue development of cruise missile behaviors for distributed, cooperative, collaborative strategies and other advanced guidance capabilities. Continue improvement of constructive and virtual analysis tools for design, development, and analysis of advanced missile concepts in representative environments. Continue engagement-level analysis on high-speed and air-to-air weapon concepts providing design, performance, and trade-space analysis to the program offices. Continue improvement of simulation technologies evaluating innovative air-to-air and air-to-surface engagements to include guidance and control evaluation. Continue inclusion of additional targets and improved terrain resolution to radar, millimeter wave, infrared, and ultraviolet signature generation capability for testing algorithms in real-time software and hardware in-the-loop environments. Continue development of high-speed hardware-in-the-loop simulation technology, including thermal environment, aerodynamic control uncertainty, seeker modeling, and navigation sensor effectiveness. Continue development of infrared light-emitting diode target simulator technology to create higher frame rate and higher resolution target simulator technology. Continue providing weapon-oriented multi-security level, cross-domain distributed modeling and simulation support using distributed connectivity</p>	24.892	30.969	25.545
--	--------	--------	--------

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>	<b>Project (Number/Name)</b> 622068 / <i>Advanced Guidance Technology</i>
--	---	--

**B. Accomplishments/Planned Programs (\$ in Millions)**

between Eglin Air Force Base facilities and other geographic locations. Continue development of 6-degrees of freedom and scene generation modules for the extended modeling and simulation community using Air Force Simulator. Continue hardware-in-the-loop activities in support of international cooperative research efforts. Complete exploration of guidance technologies for potential United States Space Force applications.

***FY 2025 Plans:***

- Continue development of cruise missile behaviors for distributed, cooperative, collaborative strategies and other advanced guidance capabilities.
- Continue improvement of constructive and virtual analysis tools for design, development, and analysis of advanced missile concepts in representative environments.
- Continue engagement-level analysis on high-speed and air-to-air weapon concepts providing design, performance, and trade-space analysis to the munitions program offices.
- Continue improvement of simulation technologies evaluating innovative air-to-air and air-to-surface engagements to include guidance and control evaluation.
- Continue inclusion of additional targets and improved terrain resolution to radar, millimeter wave, infrared, and ultraviolet signature generation capability for testing algorithms in real-time software and hardware in-the-loop environments.
- Continue development of high-speed hardware-in-the-loop simulation technology, including thermal environment, aerodynamic control uncertainty, seeker modeling, and alternative navigation sensor effectiveness.
- Continue development of infrared light-emitting diode target simulator technology to create higher frame rate and higher resolution target simulator technology.
- Continue providing weapon-oriented multi-security level, cross-domain distributed modeling and simulation support using distributed connectivity between Eglin Air Force Base facilities and other geographic locations.
- Continue development of 6-degrees of freedom and scene generation modules for the extended modeling and simulation community using Air Force Simulator.
- Continue hardware-in-the-loop activities in support of international cooperative research efforts.

***FY 2024 to FY 2025 Increase/Decrease Statement:***

FY 2025 decreased compared to FY 2024 by \$5.424 million for Guidance Technologies is due to Air Force funding re-prioritization.

	FY 2023	FY 2024	FY 2025
<b>Accomplishments/Planned Programs Subtotals</b>	70.788	88.179	72.734

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602602F / <i>Conventional Munitions</i>	Project (Number/Name) 622068 / <i>Advanced Guidance Technology</i>

**D. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>				<b>Project (Number/Name)</b> 622502 / <i>Ordnance Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
622502: <i>Ordnance Technology</i>	-	65.381	72.420	65.763	0.000	65.763	63.810	65.324	68.983	70.370	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project investigates, develops, and evaluates conventional ordnance technologies to establish technical feasibility and military utility for advanced explosives, fuzes, warheads, sub-munitions, and weapon airframes, carriage, and dispensing. The project also assesses the lethality and effectiveness of current and planned conventional weapons technology programs and assesses target vulnerability. The payoffs include improved storage capability and transportation safety of fully assembled weapons, improved warhead and fuze effectiveness, improved sub-munitions dispensing, low-cost airframe/subsystem components and structures, and reduced aerospace vehicle and weapon drag.

**B. Accomplishments/Planned Programs (\$ in Millions)**

<p><b>Title:</b> Energetic Materials Technology</p> <p><b>Description:</b> Investigates and develops energetic materials and technology that safely and securely optimize survivability, cost, and weapon lethality for munitions.</p> <p><b>FY 2024 Plans:</b> Continue advancement and development of selected energetic materials, specifically nano-intermetallic compounds, to increase energy density over traditional explosives while enhancing damage mechanisms and lethality for mass and volume-constrained applications. Continue building and implementing experimental techniques/capabilities to quantify dynamic and mechanical properties as well as survivability of energetic materials in extreme temperature and vibrational environments. Continue development of tools and analysis techniques to further the understanding of energy partitioning between blast/fragmentation and combined effects in order to optimize lethality against a broad spectrum of targets. Continue maturation of additive manufacturing techniques to increase the design space for kinetic weapon lethality and to facilitate distributed manufacturing processes. Continue formulation of novel explosive fill to satisfy severe environmental constraints. Continue development of large-scale nano-energetic material fabrication.</p> <p><b>FY 2025 Plans:</b> - Complete advancement and development of selected energetic materials, specifically nano-intermetallic compounds, to increase energy density over traditional explosives while enhancing damage mechanisms and lethality for mass and volume-constrained applications. - Continue building and implementing experimental techniques/capabilities to quantify dynamic and mechanical properties as well as survivability of energetic materials in extreme temperature and vibrational environments. - Continue development of tools and analysis techniques to further the understanding of energy partitioning between blast/fragmentation and combined effects to optimize lethality against a broad spectrum of targets.</p>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
	5.175	9.613	8.730

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>	<b>Project (Number/Name)</b> 622502 / <i>Ordnance Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Complete maturation of additive manufacturing techniques to increase the design space for kinetic weapon lethality and to facilitate distributed manufacturing processes.</li> <li>- Continue formulation of novel explosive fill to satisfy severe environmental constraints.</li> <li>- Continue development of large-scale nano-energetic material fabrication.</li> <li>- Initiate maturation of novel Energetics for Advanced Shaped Charges.</li> <li>- Initiate research of Electrical and Electromagnetic Effects in Explosives.</li> <li>- Initiate development of Digital Engineering of Energetic Material Systems.</li> <li>- Initiate development of Aging prediction models in energetic system of systems.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.884 million due to decreased emphasis upon digital engineering efforts focused on applied research for weapon energetics and formulation design.</p>			
<p><b>Title:</b> Fuze Technologies</p> <p><b>Description:</b> Investigate and develop fuzing technology for weapons to ensure reliable and optimal function to maximize weapon lethality for all engagement scenarios.</p> <p><b>FY 2024 Plans:</b> Initiate implementation of digital engineering tools to enable digital design of munition fuzes. Continue development and demonstration of alternative packaging technology for survivable fuze electronic components. Continue investigating the reliability and survivability of electronic components for prediction and measurement of fuze performance during munition penetration at high-impact speeds. Continue research facilitating tailored lethal effects that enable optimum fuzing solutions across the spectrum of weapon and target interactions as enabling technologies for agile weapon effect concepts. Continue research for distributed and multi-point fuzing concepts as enabling technologies for agile weapon effect concepts. Continue implementing additive manufacturing techniques to increase fuze reliability and to facilitate distributed manufacturing. Continue fuze explosive interfaces analysis for robust definition of explosive train reliability and performance. Continue fuze endgame, active imaging for target detection and aim point selection.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue implementation of digital engineering tools to enable digital design of munition fuzes.</li> <li>- Continue development and demonstration of alternative packaging technology for survivable fuze electronic components in weapon systems designed for multi-mission purpose.</li> <li>- Continue investigating the reliability and survivability of electronic components for prediction and measurement of fuze performance during munition penetration at high-impact speeds.</li> <li>- Continue research facilitating tailored lethal effects that enable optimum fuzing solutions across the spectrum of weapon and target interactions as enabling technologies for agile weapon effect concepts.</li> </ul>	6.335	9.803	8.902

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>	<b>Project (Number/Name)</b> 622502 / <i>Ordnance Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<ul style="list-style-type: none"> <li>- Continue research for distributed and multi-point fuzing concepts as enabling technologies for agile weapon effect concepts. Include design and development of a fuzes capable of surviving and reliably functioning in counter maritime scenarios: onset of weapon detonation on the surface, within, or beneath a maritime vessel to give warfighter flexibility in mission solutions.</li> <li>- Continue implementing additive manufacturing techniques to increase fuze reliability and to facilitate distributed manufacturing. Advance to enable frequency selective surfaces on curved surfaces to increase fuze sensor rejection of interference.</li> <li>- Continue fuze explosive interfaces analysis for robust definition of explosive train reliability and performance.</li> <li>- Continue fuze endgame, active imaging for target detection and aim point selection.</li> <li>- Initiate advances in sensor materials for radar and infrared that allows increased performance in reduced size, weight, and power for greater for agile, small, networked weapons and in harsh environments.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.901 million due to reduced focus on applied research on ordnance technologies for hypersonic applications.</p>			
--	--	--	--

<p><b>Title:</b> Warhead Technologies</p> <p><b>Description:</b> Investigate and develop innovative warhead kill mechanisms for weapons that maximize weapon lethality for all engagement scenarios.</p> <p><b>FY 2024 Plans:</b> Continue maturation of small, multi-output warhead technologies for soft-surface targets, to include limited penetration capability of surface-hardened structures. Continue evolving test capabilities to enhance quantification of the mechanical response under high-rate, high-pressure loading conditions for use in high-fidelity modeling and simulation tools, to include materials used in additive manufacturing processes, enabling digital engineering of warhead concepts. Continue developing additive manufacturing techniques and produce optimized sub-scale articles for test. Initiate demonstration of technologies for effective and survivable high-speed penetration, specifically focusing on maritime and surface targets relevant to Joint Warfighting Concept. Continue development of warhead concepts for the air targets in peer engagement scenarios. Continue research and develop cumulative damage mechanisms taking advantage of coordinated and distributed impact. Continue subsystem warhead technology integration. Complete the development of topological optimization in support of additive manufacturing.</p> <p><b>FY 2025 Plans:</b> - Continue maturation of small, multi-output warhead technologies for soft-surface targets, to include limited penetration capability of surface-hardened structures and maritime targets. - Continue evolving test capabilities to enhance quantification of the mechanical response under high-rate, high-pressure loading conditions for use in high-fidelity modeling and simulation tools, to include materials used in additive manufacturing processes, enabling digital engineering of warhead concepts. Include testing for conditions meeting maritime target data needs for models.</p>	9.016	13.648	12.393
---	-------	--------	--------



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>	<b>Project (Number/Name)</b> 622502 / <i>Ordnance Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Continue developing additive manufacturing techniques and produce optimized sub-scale articles for test. Expand material selections through partnerships within DoD.</p> <p>- Continue demonstration of technologies for effective and survivable high-speed penetration, specifically focusing on maritime and surface targets relevant to Joint Warfighting Concept in all domains. Includes warhead capable of surviving and reliably functioning in all counter maritime scenarios: weapon function capability on vessel surface, perforate and function within vessel, complete perforation through vessel and function when beneath vessel, or direct penetration through water to function underneath a vessel. Intent is to give warfighter flexibility in mission solutions.</p> <p>- Continue development of warhead concepts for the air targets in peer engagement scenarios.</p> <p>- Continue research and develop cumulative damage mechanisms taking advantage of coordinated and distributed impact.</p> <p>- Continue subsystem warhead technology integration.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$1.255 million due to decreased emphasis on high-speed ordnance technology and activation of technical facilities at the Advanced Munitions Technology Complex.</p>			
<p><b>Title:</b> Ordnance Technologies</p> <p><b>Description:</b> Investigate and develop ordnance sub-system (energetics, fuzes and war-heads) and integrated system concepts using both high-fidelity and fast-running engineering level Modeling and Simulation tools.</p> <p><b>FY 2024 Plans:</b> Continue developing validated mesoscale modeling and simulation tools for computational physics sciences. Continue to develop engineering-level simulation architecture capability to enable weapon sub-system and system-level technology assessments. Continue implementing cost-effective and rapid- transition warhead technologies for inventory weapons. Continue modeling and simulation efforts exploring the ordnance technology trade-space for low-cost, long-range munition concepts. Continue developing predictive techniques for munition effectiveness tools used in concept development and assessment as well as studies involving analysis of alternatives. Continue developing test capability and data collection for modeling and simulation tools to characterize lethality, survivability, and performance of sub-systems and integrated ordnance systems. Complete the development of ordnance test and evaluation capabilities that include thermal and vibration management for hypersonic and high-speed flight. Continue investigation of machine learning technologies for ordnance. Continue exploring the connection of ordnance modeling and simulation and lethality tools to the broader digital engineering ecosystem.</p> <p><b>FY 2025 Plans:</b> - Continue developing validated mesoscale modeling and simulation tools for computational physics sciences. - Continue to develop engineering-level simulation architecture capability to enable weapon sub-system and system-level technology assessments. - Continue implementing cost-effective and rapid- transition warhead technologies for inventory weapons.</p>	35.038	39.356	35.738

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602602F / <i>Conventional Munitions</i>	<b>Project (Number/Name)</b> 622502 / <i>Ordnance Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
<ul style="list-style-type: none"> <li>- Continue modeling and simulation efforts exploring the ordnance technology trade-space for low-cost, long-range munition concepts.</li> <li>- Continue developing predictive techniques for munition effectiveness tools used in concept development and assessment as well as studies involving analysis of alternatives.</li> <li>- Continue developing test capability and data collection for modeling and simulation tools to characterize lethality, survivability, and performance of sub-systems and integrated ordnance systems.</li> <li>- Continue investigation of machine learning technologies for ordnance.</li> <li>- Continue exploring the connection of ordnance modeling and simulation and lethality tools to the broader digital engineering ecosystem.</li> <li>- Initiate development and maturation of a mini-Joint Simulation Environment (JSE) node to conduct analysis at mission/campaign level for evaluation of munition research to optimize S&amp;T investments to meet warfighter needs.</li> <li>- Initiate development and integration of maritime lethality analysis and assessment tools for air-delivered weapons delivered by the warfighter in three counter maritime scenarios.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 decreased compared to FY 2024 by \$3.618 million due to reduced focus on applied research in lethality tools for automated Advanced Battle Management System/Joint All-Domain Command and Control and improved modeling and simulation tools for weapons design and weaponeering.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	55.564	72.420	65.763

	FY 2023	FY 2024
<b><i>Congressional Add:</i></b> Convergence technology research	9.817	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressionally directed efforts.		
<b>Congressional Adds Subtotals</b>	9.817	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not Applicable.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602605F / <i>Directed Energy Technology</i>
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	104.085	129.961	114.962	0.000	114.962	98.603	109.335	125.913	123.493	Continuing	Continuing
624866: <i>Lasers &amp; Imaging Technology</i>	-	21.740	26.254	7.115	0.000	7.115	7.158	7.451	7.501	7.587	Continuing	Continuing
624867: <i>Advanced Weapons &amp; Survivability Technology</i>	-	52.317	80.652	49.909	0.000	49.909	37.884	40.754	44.667	43.099	Continuing	Continuing
625173: <i>Laser Technology</i>	-	30.028	23.055	57.938	0.000	57.938	53.561	61.130	73.745	72.807	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program covers research in Directed Energy (DE) technologies, primarily High Energy Lasers (HEL) and High Power Electromagnetics (HPEM). High Energy Lasers (HEL) research includes moderate to high continuous power laser devices that are applicable to a wide range of applications, optical technologies to propagate laser beams through the atmosphere, and integration of these technologies into demonstration packages. High power microwaves research examines technologies for applications such as counter-electronics and nonlethal weapons. This program conducts research into other novel Directed Energy applications; conducts Directed Energy vulnerability/lethality assessments; develops protection technologies versus Directed Energy; conducts research into other advanced non-conventional/innovative weapons; develops and uses tools to compare solutions to determine the most effective and efficient Directed Energy technologies to meet Air Force needs; coordinates efforts through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

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 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602788F, 1206601SF, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

Funds in this PE may be used to investigate specified 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.

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602605F / <i>Directed Energy Technology</i>
---	---

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	120.947	129.961	125.474	0.000	125.474
Current President's Budget	104.085	129.961	114.962	0.000	114.962
Total Adjustments	-16.862	0.000	-10.512	0.000	-10.512
• 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	-10.540	0.000			
• SBIR/STTR Transfer	-2.126	0.000			
• Other Adjustments	-4.196	0.000	-10.512	0.000	-10.512

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 625173: *Laser Technology*

Congressional Add: *Program Increase - directed energy research*

Congressional Add: *Program increase - counter-UAS directed energy effectiveness*

Congressional Add: *Program increase - early detection of threats*

Congressional Add Subtotals for Project: 625173

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	5.000	-
	5.000	-
	10.000	-
	20.000	-
	20.000	-

**Change Summary Explanation**

Decrease in FY 2025 funding is due to re-prioritization to meet the nation's future security needs.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602605F / <i>Directed Energy Technology</i>				<b>Project (Number/Name)</b> 624866 / <i>Lasers &amp; Imaging Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
624866: <i>Lasers &amp; Imaging Technology</i>	-	21.740	26.254	7.115	0.000	7.115	7.158	7.451	7.501	7.587	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project explores the technical feasibility of moderate to high power lasers, including beam control, for applications such as aircraft protection, force protection, and precision engagement from the Department of the Air Force platforms. This project investigates the effects of laser weapons on a wide range of systems and components as well as producing, modifying, validating and applying Directed Energy and non-Directed Energy concept development and assessment tools to determine which technology solutions to pursue.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> High Energy Laser Technologies and Directed Energy Assessments	21.740	26.254	7.115
<p><b>Description:</b> This effort explores the technical feasibility of moderate to high power lasers, including beam control, for applications such as aircraft protection, force protection, and precision engagement from the Department of the Air Force platforms. This project investigates the effects of laser weapons on a wide range of systems and components as well as producing, modifying, validating and applying Directed Energy and non-Directed Energy concept development and assessment tools to determine which technology solutions to pursue.</p> <p><b>FY 2024 Plans:</b> Continue assessment and development of sources for beacon/tracking illuminator lasers and associated tracking and pointing improvements. Continue planning to demonstrate 100 Watt average power for beacon illuminating laser used for target acquisition. Continue development of fiber optic amplifiers that are more resistant to nonlinear effects.</p> <p><b>FY 2025 Plans:</b> - Continue the assessment and development of sources for beacon/tracking illuminator lasers and associated tracking and pointing improvements - Terminate plan to demonstrate 100 Watt average power for beacon illuminating laser used for target acquisition. - Terminate the development of fiber optic amplifiers that are more resistant to nonlinear effects to demonstrate 100 Watt average power for beacon illuminating laser used for target acquisition.</p> <p>In FY 2025, PE 0602605F, Directed Energy Technology, Project 624867, Advanced Weapon &amp; Survivability Technology partial efforts were transferred to PE 0602605F, Directed Energy Technology Project 625173, Laser Technology, in order to align funding and work.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602605F / <i>Directed Energy Technology</i>	<b>Project (Number/Name)</b> 624866 / <i>Lasers &amp; Imaging Technology</i>
--	---	---

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
FY 2025 decreased compared to FY 2024 by 19.139 million. Funding decreased due to realignment of funding and work in PE 0602605F, Directed Energy Technology Project 625173, Laser Technology.			
<b>Accomplishments/Planned Programs Subtotals</b>	21.740	26.254	7.115

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602605F / <i>Directed Energy Technology</i>				<b>Project (Number/Name)</b> 624867 / <i>Advanced Weapons &amp; Survivability Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
624867: <i>Advanced Weapons &amp; Survivability Technology</i>	-	52.317	80.652	49.909	0.000	49.909	37.884	40.754	44.667	43.099	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project explores the use of High Power Microwave and other unconventional/innovative weapon concepts to support applications on the Department of the Air Force platforms such as base defense and electronic warfare including disruption, degradation, and damage of electronic infrastructure. This research includes weapon technology that can provide covert effects and/or no collateral or human damage. The project also investigates the effects of potential adversary High Power Microwave weapons and how to mitigate those effects on US assets, as well as producing and applying Directed Energy and non-Directed Energy concept development and assessment tools to determine which technology solutions to pursue. This project includes but is not limited to high power microwaves, plasmas, particle beams, and millimeter waves

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> High Power Microwave and Unconventional Weapon Technologies	20.208	38.417	23.773
<b>Description:</b> Investigate technologies for High Power Microwave and unconventional weapon components. Investigate High Power Microwave and other unconventional weapon concepts using innovative technologies. Investigate advanced technologies that support force protection tactical applications, including non-kinetic/non-lethal counter-electronics applications.			
<b>FY 2024 Plans:</b> Complete effects testing and propagation experiments to define the performance requirements to develop an ultra-short pulsed laser system. Complete design and develop high power microwave technology that could be integrated into an airborne platform for the next generation Department of the Air Force airborne high power microwave technology demonstration. Continue developing smaller, higher power source technology with all support components to enable the next generation Department of the Air Force high power microwave demonstration. Continue testing high power microwave components for ground and aerial high power microwave demonstrators. Continue supporting the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community. Initiate research to build sources to address high priority, real-world events. Initiate increased effort to research microwave propagation through arctic environments and effects to support future airborne applications.			
<b>FY 2025 Plans:</b> - Terminate the development of smaller, higher power source technology with all support components to enable the next generation Department of the Air Force (DAF) high power microwave demonstration; ensure technology fits in the size and weight restrictions of relevant platforms.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602605F / <i>Directed Energy Technology</i>	<b>Project (Number/Name)</b> 624867 / <i>Advanced Weapons &amp; Survivability Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Complete the testing of high power microwave components for ground and aerial high power microwave demonstrators; test components in relevant environments to ensure their functionality; work towards reduced logistic requirements to ease maintenance of the systems.</li> <li>- Continue supporting the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community.</li> <li>- Reduce research effort to build sources to address high priority, real-world events; design sources that can increase the target set of high power microwave systems.</li> <li>- Terminate research of microwave propagation through arctic environments and effects to support future applications; evaluate required power and range for operationally relevant capabilities in those environments.</li> <li>- Initiate in-house government evaluation of mission sets for particle beam technologies.</li> <li>- Initiate the development of solid state devices for pulse power systems and radio frequency generation.</li> <li>- Initiate in-house government exploration of new and novel antenna designs to reduce size, weight, and infrastructure while maintaining performance.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$14.644 million. Funding decreased due to re-prioritization to meet the nation's future security needs.</p>			
<p><b>Title:</b> High Power Microwave Effects</p> <p><b>Description:</b> Assess the effects/lethality of High Power Microwave technologies. Develop and apply sophisticated models to enhance the development of High Power Microwave and related technology. Develop tools and perform assessments which allow comparisons among Directed Energy concepts and tradeoffs between Directed Energy and non-Directed Energy solutions.</p> <p><b>FY 2024 Plans:</b> Complete the transition of software applications hosted in the directed energy High Performance Computing Software Applications Institute for a broad spectrum directed energy sources. Continue populating the database of high power sources to include solid-state sources. Initiate increased effort conducting military utility assessments of high power microwave weapon technology integrated into the kill-chain for multiple target engagements using end-to-end mission level modeling. Continue assessing synergistic weapon concepts that merge kinetic energy and non-kinetic high power microwave weapon capabilities into one weapon system. Continue supporting the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community. Complete validation of the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community. Complete transition of the validated modeling, simulation, and analysis tools to the broader modeling, simulation, and analysis community.</p> <p><b>FY 2025 Plans:</b></p>	32.109	42.235	26.136



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602605F / <i>Directed Energy Technology</i>	<b>Project (Number/Name)</b> 624867 / <i>Advanced Weapons &amp; Survivability Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Reduce effort in populating the database of high power sources to include solid-state sources; focus on new frequencies and waveforms to increase potential target list susceptible to high power microwaves.</li> <li>- Terminate the military utility assessments of high power microwave weapon technology integrated into the kill-chain for multiple target engagements using end-to-end mission level modeling.</li> <li>- Terminate assessing synergistic weapon concepts that merge kinetic energy and non-kinetic high power microwave weapon capabilities into one weapon system; perform engagement and mission level modeling to determine military utility.</li> <li>- Initiate in-house government development of modeling and simulation tools to decrease the time required for each run while also reducing the processing power required to perform a run.</li> <li>- Continue supporting the modeling, simulation, and analysis tools that have been transitioned to the broader modeling, simulation, and analysis community; collaborating with Corporate Model Analyze (CMA) at enterprise level and with The Technical Cooperation Program (TTCP) at international level.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 decreased compared to FY 2024 by \$16.099 million. Funding decreased due to re-prioritization to meet the nation's future security needs.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	52.317	80.652	49.909

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602605F / <i>Directed Energy Technology</i>				<b>Project (Number/Name)</b> 625173 / <i>Laser Technology</i>			
COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
625173: <i>Laser Technology</i>	-	30.028	23.055	57.938	0.000	57.938	53.561	61.130	73.745	72.807	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This project explores the technical feasibility of moderate to high continuous power lasers, including beam control, for applications such as aircraft protection, base protection, and precision engagement from the Department of the Air Force platforms. This project investigates the effects of laser weapons on a wide range of systems and components as well as producing, modifying, validating and applying Directed Energy and non-Directed Energy concept development and assessment tools to determine which technology solutions to pursue.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<b>Title:</b> Laser Technology	10.028	23.055	57.938
<p><b>Description:</b> Develop and demonstrate High Energy Laser device technologies for the Department of the Air Force applications. Develop and demonstrate laser beam control technologies including atmospheric propagation and pointing and tracking. Perform laser system level modeling and simulation validated by laser effects and vulnerability testing. Develop tools and perform assessments which allow comparisons among concepts and tradeoffs between Directed Energy and non-Directed Energy solutions. Integrate optical beam control technologies with laser device technologies and demonstrate the combined technologies. Develop and use modeling, testing and diagnostic technologies to better understand the vulnerability of adversary weapon systems to High Energy Lasers.</p> <p><b>FY 2024 Plans:</b> Continue development and validation of the predictive physics-based end-to-end model that covers all elements of laser weapon systems (LWS)-photon "birth to death". Initiate increase emphasis assessment of electric laser sources for all Air Force Directed Energy applications. Continue and increase effort on developing laser vulnerability models for high-priority emerging threat systems. Continue transitioning models to the Department of Defense and industry modeling, simulation, and analysis community. Continue tabletop exercises and focused wargames to develop concepts of employment for directed energy weapons in representative scenarios and vignettes.</p> <p><b>FY 2025 Plans:</b> - Reduce effort for development and validation of the predictive physics-based end-to-end model that covers all elements of laser weapon systems (LWS)-photon "birth to death" to in-house government personnel. - Continue emphasis on assessment of electric laser sources for all Air Force Directed Energy applications with inhouse effort. - Reduce effort on developing laser vulnerability models for high-priority emerging threat systems to in-house government personnel. - Reduce effort on transitioning models to the Department of Defense and industry modeling, simulation, and analysis community.</p>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602605F / <i>Directed Energy Technology</i>	<b>Project (Number/Name)</b> 625173 / <i>Laser Technology</i>
--	---	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
<ul style="list-style-type: none"> <li>- Continue tabletop exercises and focused wargames to develop concepts of employment for directed energy weapons in representative scenarios and vignettes.</li> <li>- Reduce effort on tabletop exercises and focused wargames to develop concepts of employment for directed energy weapons in representative scenarios and vignettes</li> <li>- Reduce development of fiber optic amplifiers that are more resistant to nonlinear effects.</li> <li>- In FY 2025, PE 0602605F, Directed Energy Technology, Project 624867, Advanced Weapon &amp; Survivability Technology partial efforts were transferred to PE 0602605F, Directed Energy Technology Project 625173, Laser Technology, in order to align funding and work.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 funding increased compared to FY 2024 by 34.883 million due to re-prioritization to meet the nation's future security needs and to account for civilian pay.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	10.028	23.055	57.938

	FY 2023	FY 2024
<b><i>Congressional Add:</i></b> Program Increase - directed energy research <b><i>FY 2023 Accomplishments:</i></b> Conduct Congressional directed efforts.	5.000	-
<b><i>Congressional Add:</i></b> Program increase - counter-UAS directed energy effectiveness <b><i>FY 2023 Accomplishments:</i></b> Conduct Congressional directed efforts.	5.000	-
<b><i>Congressional Add:</i></b> Program increase - early detection of threats <b><i>FY 2023 Accomplishments:</i></b> Conduct Congressional directed efforts.	10.000	-
<b>Congressional Adds Subtotals</b>	20.000	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Non Applicable

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>					<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>							
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
Total Program Element	-	258.606	182.076	176.333	0.000	176.333	176.607	184.546	201.492	205.485	Continuing	Continuing
625315: <i>C4I Dominance Technology</i>	-	178.679	89.429	87.270	0.000	87.270	85.683	92.773	100.445	102.451	Continuing	Continuing
625319: <i>Cyberspace Dominance Technology</i>	-	56.570	65.335	62.674	0.000	62.674	63.997	65.304	71.593	73.006	Continuing	Continuing
62OMMS: <i>Research Site Support</i>	-	23.357	27.312	26.389	0.000	26.389	26.927	26.469	29.454	30.028	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops enterprise-centric information technology for the Department of the Air Force. Advances in enterprise-centric information technologies are required to increase warfighter readiness and effectiveness by providing the right information, at the right time, in the right format, anytime, anywhere in the world. The C4I Dominance Technology project provides the technologies for (a) secure, self-configuring, self-healing, seamless networks; (b) timely delivery of information to tactical assets; (c) scaling, robustness, and collaboration features required of the Department of the Air Force net-centric information management environment; and (d) real-time effective portrayal of complex data sets. This project also provides a network-centric, collaborative intelligence analysis capability that enables the fusion of multi-intelligence and sensor sources to provide timely situational awareness, understanding, and anticipation of the threats in the battlespace; and the advanced, novel exploitation technologies needed to intercept, collect, locate, and process both covert and overt raw data from intelligence and sensor sources. The Cyberspace Dominance Technology project provides technologies to deliver a full range of options in cyberspace on par with air and space dominance in each of the areas of cyber-attack, cyber defense, and cyber support to achieve the strategic capability of cyber dominance. This project also provides technology that ensures Department of Air Force ability to (a) access, maintain presence on, and deliver effects to adversary systems; (b) detect, defend, and respond to attacks on friendly computer systems and provide forensic analysis concerning those attack attempts; (c) bring game-changing computing power to the warfighter and disruptive computing power at the tactical edge and for federated grid services; and (d) provide cyber situational awareness to Department of the Air Force Commanders. The Research Site Support project provides the Rome Research Site infrastructure at Rome, New York and provides for the continued operations of all Rome Research Site properties, buildings, and services necessary for the research mission. Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

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 the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0603788F, and 0602298F.

Funds in this program element may be used to investigate specified technology advancements in air, space and/or cyber domains.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 2: Applied Research</i>	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>
---	--

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	271.005	182.076	175.548	0.000	175.548
Current President's Budget	258.606	182.076	176.333	0.000	176.333
Total Adjustments	-12.399	0.000	0.785	0.000	0.785
• 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	-5.757	0.000			
• Other Adjustments	-6.642	0.000	0.785	0.000	0.785

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project: 625315: C4I Dominance Technology**

- Congressional Add: *Program Increase - Quantum Network Testbed*
- Congressional Add: *Internet of Things Innovation Ecosystem*
- Congressional Add: *University-based Quantum Materials Applied Research*
- Congressional Add: *Program Increase - Secure Quantum Computing Facility*
- Congressional Add: *Program Increase - Trapped Ion Quantum Computer*
- Congressional Add: *Traffic management operational readiness*

Congressional Add Subtotals for Project: 625315

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	9.787	-
	4.893	-
	29.363	-
	19.575	-
	29.363	-
	9.787	-
Congressional Add Subtotals for Project: 625315	102.768	-
Congressional Add Totals for all Projects	102.768	-

**Change Summary Explanation**

Decrease in FY 2025 funding is due to re-prioritization to meet the nation's future security needs.

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625315 / <i>C4I Dominance Technology</i>
--	--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To	Total
											Complete	Cost
625315: <i>C4I Dominance Technology</i>	-	178.679	89.429	87.270	0.000	87.270	85.683	92.773	100.445	102.451	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Department of the Air Force requires advanced technologies which support the Department of the Air Force core missions and enable the Department of the Air Force to achieve Global Vigilance, Global Reach, and Global Power in support of national security objectives. The technologies developed under this project enable the National Defense Strategy and Department of the Air Force future operating concepts which require operational agility (the ability to rapidly generate—and shift among—multiple solutions for a given challenge), creating combinations of air, space, and cyberspace capabilities to achieve desired effects in the battlespace.

This project provides the technologies for secure, self-configuring, self-healing, seamless networks; advanced communications processors; anti-jam and low probability of intercept communications techniques; agile and dynamic policy-based network management capabilities; and modular, programmable, low-cost software radios. In addition, it develops both the technology base for ultra-wide bandwidth and multi-channeled communications networks (both air and space based) on and between platforms.

This project provides the technologies which enable the ability to globally share, discover, and access information across organizational, functional, and coalition boundaries and between and among domains, the timely delivery of information to tactical assets, the tailoring and prioritization of information based on mission needs and importance, and the scaling, robustness, and collaboration features required of the Department of the Air Force net-centric information management environment.

This project advances technologies enabling the effective execution of military objectives that will vastly improve the ability to support the commander and staff's ability to command all viable options to achieve desired effects across the full spectrum of operations (air, space, and cyberspace) at all levels of war (strategic, operational, and tactical) and during all phases of conflict. This project provides technologies for anticipatory decision support; course of action development, planning, scheduling, and assessment; and the real-time effective portrayal of complex data sets.

This project improves and automates the capability to generate, process, manage, fuse, exploit, interpret, and disseminate timely and accurate information. This project provides not only a network-centric, collaborative intelligence analysis capability that enables the fusion of multi-intelligence and sensor sources to provide timely situational awareness, understanding, and anticipation of the threats in the battlespace, but also the advanced, novel exploitation technologies needed to intercept, collect, locate, and process both covert and overt raw data from intelligence and sensor sources.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<b>Title:</b> Assured Communications & Networks	17.861	17.355	22.920
<b>Description:</b> Develop communications, networking, and signal processing technologies with improved survivability and capacity to provide secure, adaptive, covert, anti-jam, and assured global battlespace connectivity tailored to anti-access and area-denial			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625315 / <i>C4I Dominance Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>environments and contested operations. Includes the research and development to advance existing nuclear capable forces to ensure command, control, and connectivity for the President without constraints.</p> <p><b>FY 2024 Plans:</b> Continue the research and development of technologies for robust, adaptive, and mission aware airborne networks. Continue the research and development of large-scale hardware-in-the-loop verification of developed directional networking protocols. Continue the research and development of propagation models. Decrease the development of a network stack suitable for high-bandwidth terahertz links. Continue the development, verification, and validation of advanced, airborne high-frequency antenna/ionospheric structure. Continue the development of an airborne mesh networking capability that utilizes adaptive and responsive antennas for a dynamic and reliable high capacity mesh network suitable for communications in contested environments. Continue the development, verification, and test of advanced waveforms. Continue the development, verification, and test of software-defined radio prototypes. Continue development of enhanced assurance and filtration offloading. Continue to develop, verify, and validate software-defined radio prototypes. Continue to develop capabilities that incorporate communications network connectivity into information extraction tools. Initiate implementation and simulation against several adversarial interference conditions, and initiate developing and testing the operationally-relevant scenario.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Initiate research and development on control technology for modular analog antenna arrays and begin developing tracking algorithms and software interfaces for use with these arrays.</li> <li>- Initiate research and development of a wireless communications system operating at frequencies above 100 GHz (terahertz band) with low probability of detection and anti-jam properties, for communications in contested environments.</li> <li>- Initiate development on Artificial Intelligence/Machine Learning (AI/ML)-based tactical communications waveforms and an emulation environment to test the performance of developed waveforms.</li> <li>- Continue implementation and simulation against several adversarial interference conditions for operationally-relevant scenarios.</li> <li>- Complete the research and development of technologies for robust, adaptive, and mission-aware airborne networks.</li> <li>- Complete the research and development of large-scale hardware-in-the-loop verification of developed directional networking protocols.</li> <li>- Complete the research and development of propagation models.</li> <li>- Complete the development of a network stack suitable for high-bandwidth terahertz links.</li> <li>- Complete the development, verification, and validation of an advanced, airborne high-frequency antenna/ionospheric structure.</li> <li>- Complete the development of an airborne mesh networking capability that utilizes adaptive and responsive antennas for a dynamic and reliable high capacity mesh network suitable for communications in contested environments.</li> <li>- Complete the development, verification, and test of advanced waveforms.</li> <li>- Complete the development, verification, validation, and test of software-defined radio prototypes.</li> </ul>			



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625315 / <i>C4I Dominance Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Complete the development of enhanced assurance and filtration offloading.</p> <p>- Complete the development of capabilities that incorporate communications network connectivity into information extraction tools.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$5.565 million due to re-prioritization to meet the nation's future security needs; and increased emphasis in assured and resilient communications and networks for modular analog antenna arrays for autonomous collaborative platforms, AI/ML-based tactical communications waveforms, and wireless devices at frequencies above 100 GHz for distributed command and control in highly contested environments.</p>			
<p><b>Title:</b> Data to Decisions</p> <p><b>Description:</b> Investigate and develop technologies for decision quality information dissemination services via publish, subscribe, and query across the Global Information Grid to enterprise and tactical assets and coalition partners.</p> <p><b>FY 2024 Plans:</b> Continue the research and development of data analytics and strategic indications and warnings technologies (including large data alignment, indexing and search on textual data, large-scale and disparate data sources, both structured and unstructured data, and employment of various ontologies and machine learning techniques). Continue the development of Conversational Artificial Intelligence (CAI) capabilities to deliver conversational agents capable of answering complex analytical questions. Continue the development of a user customizable entity, event, and relation text extraction capability with automatic performance estimates of the user-customized extractors on new documents and mission areas. Continue research and development of a Request for Information dialog system that can help answer RFIs for single service applications across 10 essential Intelligence enterprise identified RFIs. Continue the development of a Multi-Source Intelligence, Surveillance, and Reconnaissance ontology connecting Air Force analytics, Application Programming Interfaces, and services. Continue research and development of an integrated threat detection system based on vetted events from Publicly Available Information fused and corroborated with ISR sources. Continue the research and development of autonomous, heterogeneous, distributed multi-sensor management and upstream data fusion for improved target detection, tracking, and classification. Continue the development of new methods that exploit traditional and non-traditional data to categorize and predict engagement scenarios of coordinated, non-cooperative targets, and that assess the threats based on situation-driven adversary capabilities. Continue to develop capabilities to automate emitter corridor extraction and mode tagging to deploy capabilities onboard the collection platform. Continue research to add new data sources to identify signatures corresponding to different categories of multi-satellite actions. Continue researching methods that allow for change detection and pattern recognition. Continue research to seek correlations between non-traditional data source signatures and multi-satellite actions. Initiate development of a machine-learning environment to autonomously govern the execution of composite tasks. Initiate development of an analyst recognition engine for application programming interfaces, data, and services. Complete development of Counter Small Unmanned Air Systems detection and identification technology. Complete</p>	13.124	16.512	21.875

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625315 / <i>C4I Dominance Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>a proof-of-concept assistant to perform composite tasks over multiple turns. Initiate development of an advanced multimodal threat forecasting system.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Initiate research and development for a High-Value Target (HVT) recommendation system and system architecture.</li> <li>- Initiate research and development of an automated multi-source data fusion and spatio-temporal grounding capability, seeking opportunities for future applications with existing targeting systems.</li> <li>- Initiate research and development of multi-channel emitter detection and geolocation system hardware, intercept processing software, distributed sensing and automated target detection, recognition software, and ontology development.</li> <li>- Continue research to seek correlations between non-traditional data source signatures and multi-satellite actions.</li> <li>- Continue research to advance the Strategic Sensing Grid orchestration and data exploitation. Starting in FY 2025, this work moved from the Processing Technologies effort to the Data to Decisions effort.</li> <li>- Complete the research and development of data analytics and strategic indications and warnings technologies (including large data alignment, indexing and search on textual data, large-scale and disparate data sources, both structured and unstructured data, and employment of various ontologies and machine learning techniques).</li> <li>- Complete the development of Conversational Artificial Intelligence (CAI) capabilities to deliver conversational agents capable of answering complex analytical questions.</li> <li>- Complete the development of a user customizable entity, event, and relation text extraction capability with automatic performance estimates of the user-customized extractors on new documents and mission areas.</li> <li>- Complete research and development of a Request for Information dialog system that can help answer RFIs for single service applications across 10 essential Intelligence enterprise identified RFIs.</li> <li>- Complete the development of a Multi-Source Intelligence, Surveillance, and Reconnaissance ontology connecting Air Force analytics, Application Programming Interfaces, and services.</li> <li>- Complete research and development of an integrated threat detection system based on vetted events from Publicly Available Information fused and corroborated with ISR sources.</li> <li>- Complete the research and development of autonomous, heterogeneous, distributed multi-sensor management and upstream data fusion for improved target detection, tracking, and classification.</li> <li>- Complete the development of new methods that exploit traditional and non-traditional data to categorize and predict engagement scenarios of coordinated, non-cooperative targets, and that assess the threats based on situation-driven adversary capabilities.</li> <li>- Complete the development of capabilities to automate emitter corridor extraction and mode tagging to deploy capabilities onboard the collection platform.</li> <li>- Complete the research of methods that allow for change detection and pattern recognition.</li> <li>- Complete development of a machine-learning environment to autonomously govern the execution of composite tasks.</li> <li>- Complete development of an analyst recognition engine for application programming interfaces, data, and services.</li> </ul>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625315 / <i>C4I Dominance Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Complete development of an advanced multimodal threat forecasting system.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$5.363 million due to re-prioritization to meet the nation's future security needs; and increased emphasis in algorithm development for recommending and tracking of HVTs, multi-source data fusion for targeting, and development of multi-INT targeting through emitter detection, geolocation, recognition, and intercept processing.</p>				
<p><b>Title:</b> Processing Technologies</p> <p><b>Description:</b> Develop automatic and dynamically reconfigurable, scalable, affordable distributed peta-flop processing technologies for real-time global information systems.</p> <p><b>FY 2024 Plans:</b> Continue advancing the application of novel neuromorphic systems for robust machine learning. Continue advancing research and development of the neuromorphic processor and validate capabilities for dynamic learning on mobile and power-constrained platforms. Complete the development of a model integrated with existing embedded high performance computing systems. Complete the development and delivery of a Neuromorphic High-Performance-Computing (Brain-in-the-Box). Initiate research to advance the Strategic Sensing Grid orchestration and data exploitation.</p> <p><b>FY 2025 Plans:</b> - Initiate research and development to collaborate with designated universities to produce a super computer in a compact container. - Continue advancing the application of novel neuromorphic systems for robust and dynamic machine learning, including on mobile or power-constrained platforms. - Starting in FY 2025, the Strategic Sensing Grid orchestration and data exploitation work moved from the Processing Technologies effort to the Data to Decisions effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$1.271 million due to re-prioritization to meet the nation's future security needs; and increased emphasis in edge computing and neuromorphic computing with associated artificial intelligence/machine learning (AI/ML) applications through the development of a super computer in a compact container.</p>		6.202	6.616	7.887
<p><b>Title:</b> Multi-Domain Command &amp; Control (MDC2)</p> <p><b>Description:</b> Develop advanced monitoring, planning, and assessment technologies enabling aerospace commanders to develop effects-based campaigns. Investigate, analyze, and develop technologies for planning, execution, and automatic rapid reconfiguration of distributed intelligent and integrated command and control information systems to achieve the commander's intent throughout varying crisis levels.</p>		16.828	19.435	23.011

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625315 / <i>C4I Dominance Technology</i>

**B. Accomplishments/Planned Programs (\$ in Millions)**

***FY 2024 Plans:***

Continue research for applying machine learning techniques to enhance and optimize multi domain operations (including space). Complete research into a mathematical framework and provide a method for evaluating and presenting multi-domain courses of action to maximize operational effects for decisive advantage. Continue the development of tools, technology, and a framework for execution management of operational center process workflows and applications. Continue the research and development of a novel composable planning paradigm to overcome the serial and time-intensive nature of existing planning techniques.

***FY 2025 Plans:***

- Initiate research and development to manage the complexity of distributed C2 resources and assess the ability to perform task redistribution in a highly-resource constrained environment.
- Initiate development of standards that will be used to create an end-to-end (Australia, United States, and United Kingdom) joint machine learning ecosystem for the rapid development, sharing, and deployment of machine learning and artificial intelligence (AI) tools to enable joint AI missions for national and coalition operational capabilities.
- Initiate research and development of generative AI techniques applied to AF data and problem sets through selected use cases focusing on indicators and warnings analysis and multi-modal knowledge analysis through sensor fusion.
- Continue advancing the research and development of machine learning approaches for supporting and performing operations in complex adversarial environments.
- Complete research for applying machine learning techniques to enhance and optimize multi-domain operations (including space).
- Complete the development of tools, technology, and a framework for execution management of operational center process workflows and applications.
- Complete the research and development of a novel composable planning paradigm to overcome the serial and time-intensive nature of existing planning techniques.
- Complete research to understand operational needs of machine learning algorithms and systems with the multi-domain command and control connect.
- Complete research into the application of Interactive Learning (IL) techniques to the auto-planning problem and development of an IL based planning capability to augment existing auto-planning tools.
- Complete the research and development of machine learning approaches for supporting and performing operations in complex adversarial environments.

***FY 2024 to FY 2025 Increase/Decrease Statement:***

FY 2023	FY 2024	FY 2025

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625315 / <i>C4I Dominance Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 funding increased compared to FY 2024 by \$3.576 million due to re-prioritization to meet the nation's future security needs; S&T research efforts planned for the Artificial Intelligence/Autonomy/Machine Learning thrust are being moved to this thrust.				
<p><b>Title:</b> Artificial Intelligence/Autonomy/Machine Learning</p> <p><b>Description:</b> Perform research and development (R&amp;D) to harness the speed and scale of computers and machines to address problems of complexity.</p> <p><b>FY 2024 Plans:</b> Continue advancing the research and development of machine learning approaches for supporting and performing operations in complex adversarial environments. Continue the research to understand operational needs of machine learning algorithms and systems with the multi-domain command and control connect. Continue research into the application of Interactive Learning techniques to the auto-planning problem and development of an IL based planning capability to augment existing auto-planning tools. Continue the research and development of machine learning approaches for supporting and performing operations in complex adversarial environments.</p> <p><b>FY 2025 Plans:</b> - In FY 2025, this research is continued in the Multi-Domain Command and Control thrust.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$15.596 million due to the research efforts in this thrust being moved to the Multi-Domain Command and Control thrust.</p>		14.517	15.596	0.000
<p><b>Title:</b> Quantum Information Science</p> <p><b>Description:</b> Perform research and development (R&amp;D) that will utilize quantum physics for the storage, transmission, manipulation, computing, or measurement of information in ways that offer advantages to classical capabilities.</p> <p><b>FY 2024 Plans:</b> Continue research and development in the area of supreme and quantum computing information sciences. Continue to advance development of further reducing SWaP of network node demonstrations. Continue demonstration of quantum information processing on a single chip by using developed quantum photonics processor with photon sources. Initiate research and development of quantum photonic integrated circuits for transmission/node operations. Initiate research into designs for network architecture and connectivity.</p> <p><b>FY 2025 Plans:</b> - Continue research and analysis into designs for network architecture and connectivity and advanced network node operation.</p>		7.379	13.915	11.577

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625315 / <i>C4I Dominance Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue research and development in the area of supreme and quantum computing information sciences.</li> <li>- Continue to advance development of further reducing Size, Weight, and Power (SWaP) of network node demonstrations.</li> <li>- Continue demonstration of quantum information processing on a single chip by using developed quantum photonics processor with photon sources.</li> <li>- Continue research and development of quantum photonic integrated circuits for transmission/node operations.</li> <li>- Continue research into designs for network architecture and connectivity.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$2.338 million due to re-prioritization to meet the nation's future security needs; and decreased emphasis in quantum network and communications, and quantum computing information science.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	75.911	89.429	87.270

	<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Program Increase - Quantum Network Testbed <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts.	9.787	-
<b>Congressional Add:</b> Internet of Things Innovation Ecosystem <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts.	4.893	-
<b>Congressional Add:</b> University-based Quantum Materials Applied Research <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts.	29.363	-
<b>Congressional Add:</b> Program Increase - Secure Quantum Computing Facility <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts.	19.575	-
<b>Congressional Add:</b> Program Increase - Trapped Ion Quantum Computer <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts.	29.363	-
<b>Congressional Add:</b> Traffic management operational readiness <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts.	9.787	-
<b>Congressional Adds Subtotals</b>	102.768	-

**C. Other Program Funding Summary (\$ in Millions)**  
N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602788F / <i>Dominant Information Sciences and Methods</i>	Project (Number/Name) 625315 / <i>C4I Dominance Technology</i>

**C. Other Program Funding Summary (\$ in Millions)**

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>				<b>Project (Number/Name)</b> 625319 / <i>Cyberspace Dominance Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
625319: <i>Cyberspace Dominance Technology</i>	-	56.570	65.335	62.674	0.000	62.674	63.997	65.304	71.593	73.006	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Department of the Air Force requires technologies to deliver a full range of options in cyberspace on par with air and space dominance in each of the areas of cyber-attack, cyber defense, and cyber support to achieve the strategic capability of cyber dominance. The Department of the Air Force requires the development of superior, intelligent, on-demand computing to enable information superiority to include advances in secure information sharing across domains and boundaries as well as technologies that successfully deter any adversary from attacking computer systems anytime, anywhere by ensuring the Department of the Air Force's ability to: access, maintain presence on, and deliver effects to adversary systems; detect, defend, and respond to attacks on friendly computer systems and provide forensic analysis concerning those attack attempts; and provide cyber situational awareness to Department of the Air Force Commanders. In addition, the Department of the Air Force requires technology development that produces computing architectures with greater capacity and sophistication for addressing constrained, dynamic mission objectives; game-changing computing power to the warfighter, disruptive computing power at the tactical edge and for federated grid services; and interactive and real-time computing improving the usability of high-performance computing to the Department of the Air Force. It includes technologies in computational sciences and engineering, computer architectures and software intensive systems.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Cyber Defense Technologies	27.923	32.035	0.000
<b>Description:</b> Develop cyber defense and supporting technologies to detect, defend, and respond to attacks on computer systems as well as provide forensic concerning attacks.			
Starting in FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust.			
<b>FY 2024 Plans:</b>			
Continue research in the area of autonomous integrated cyber operations. Continue research into mission-specific block-chain capabilities and the alignment of cyber resilient services. Continue research and validation of a cyber-hardened (robust, secure) processor for embedded weapon systems. Continue applied research to create trusted and resilient embedded systems that are capable of identifying, localizing, and automatically repairing previously unknown and/or unintended vulnerabilities. Continue development of software using evolutionary approaches to make embedded systems tolerant to unexpected and unforeseen situations. Continue research effort to discover concepts and capabilities for cyber survivability techniques and algorithms for counter-unmanned aerial systems. Continue development of a counter-unmanned aerial systems open architecture to enable interoperability. Continue evolution of autonomous machine learning functions, including the validation and demonstration of automated workflows into defensive cyber operations systems. Continue development of a model-assisted concolic firmware exploration and threat models based on device behavior. Continue conducting large scale device analysis and demonstration			



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625319 / <i>Cyberspace Dominance Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>on AF-relevant system. Continue to create a capability to model, intercept, and synchronize the state of all embedded devices connected on a single bus. Continue development of a physics-based and topologically-based model of an intra-connected and inter-connected electric power grid and communications network. Continue research and develop the design, implementation, and evaluation of a proof-of-concept model to enable secure and efficient outsourcing of relational queries and Machine Learning training. Initiate research on the inference to untrusted clouds with cost-based optimization options, under Multiparty Computation (MPC) protocols with different threat models, guarantees, and physical deployments (i.e., Local Area Network, Wide Area Networks, Blockchain, or mixed) settings. Initiate research to implement a binary injection suite on software binaries. Initiate research on expansion of software introspection techniques to exploit introspection accelerator capabilities. Complete the implementation of multiparty computation and zero knowledge proof schemes over multiple content service providers.</p> <p><b>FY 2025 Plans:</b> - In FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$32.035 million due to research being moved to the Cyber Offensive and Defensive Technologies thrust.</p>				
<p><b>Title:</b> Cyber Offense Technologies</p> <p><b>Description:</b> Develop offensive cyber operations technologies to access, maintain presence on, and deliver effects to adversary systems.</p> <p>Starting in FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust.</p> <p><b>FY 2024 Plans:</b> Continue research and development of game changing technologies which employ dominant power for cyber offensive operations and information warfare to change the future fight. Continue research and development in capabilities for multi-function, non-kinetic cyber effects against adversarial systems. Continue to demonstrate ground-based and airborne delivery of disrupt, deny, degrade, destroy, or deceive effects that are both cyber and physical/kinetic. Continue the advancement of research in systems to perform blind data discovery associated with the Internet of Things. Continue research and development for the identification of items of interest associated with the Internet of Things. Continue research for specific items of interest within the Internet of Things. Initiate development of a model of an Electrical Power and interconnected communication network. Initiate and complete the design, implementation, and test of user equipment positioning and geofencing methods.</p> <p><b>FY 2025 Plans:</b></p>		28.647	33.300	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625319 / <i>Cyberspace Dominance Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
- In FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust.				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$33.3 million due to research being moved to the Cyber Offensive and Defensive Technologies thrust.				
<b>Title:</b> Cyber Offensive and Defensive Technologies		-	0.000	62.674
<b>Description:</b> Research, design, and develop cyber warfighting, assurance, and electromagnetic (EM) convergence technologies to support offensive and defensive operations across multiple domains.				
For FY 2024 and prior years, this research was performed in the Cyber Defense Technologies and Cyber Offense Technologies thrusts.				
<b>FY 2024 Plans:</b> Not applicable				
<b>FY 2025 Plans:</b>				
<ul style="list-style-type: none"> <li>- Initiate applied research for software assurance, vulnerability discovery, and analysis of source and executable code.</li> <li>- Continue development of algorithms and a physics and topologically-based model to detect critical nodes within an intra-connected and inter-connected critical infrastructure electrical power grid and communications network.</li> <li>- Complete research in the area of autonomous integrated cyber operations.</li> <li>- Complete research into mission-specific block-chain capabilities and the alignment of cyber resilient services.</li> <li>- Complete research and validation of a cyber-hardened (robust, secure) processor for embedded weapon systems.</li> <li>- Complete development of software using evolutionary approaches to make embedded systems tolerant to unexpected and unforeseen situations.</li> <li>- Complete research to discover concepts and capabilities for cyber survivability techniques and algorithms for counter-unmanned aerial systems.</li> <li>- Complete development of a counter-unmanned aerial system open architecture to enable interoperability.</li> <li>- Complete evolution of autonomous machine learning functions, including the validation and demonstration of automated workflows into defensive cyber operations systems.</li> <li>- Complete development of a model-assisted concolic firmware exploration and threat models based on device behavior.</li> <li>- Complete large scale device analysis and demonstration on an AF-relevant system.</li> <li>- Complete creation of a capability to model, intercept, and synchronize the state of all embedded devices connected on a single bus.</li> </ul>				

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 625319 / <i>Cyberspace Dominance Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Complete research and development of the design, implementation, and evaluation of a proof-of-concept model to enable secure and efficient outsourcing of relational queries and machine learning training.</li> <li>- Complete research and development of game changing technologies which employ dominant power for cyber offensive operations and information warfare to change the future fight.</li> <li>- Complete research and development in capabilities for multi-function, non-kinetic cyber effects against adversarial systems.</li> <li>- Complete demonstration of ground-based and airborne delivery of disrupt, deny, degrade, destroy, or deceive effects that are both cyber and physical/kinetic.</li> <li>- Complete the advancement of research in systems to perform blind data discovery associated with the Internet of Things.</li> <li>- Complete research and development for the identification of items of interest associated with the Internet of Things.</li> <li>- Complete research on the inference to untrusted clouds with cost-based optimization options, under Multiparty Computation (MPC) protocols with different threat models, guarantees, and physical deployments (i.e., Local Area Network, Wide Area Networks, Blockchain, or mixed) settings.</li> <li>- Terminate research to implement a binary injection suite on software binaries and research on expansion of software introspection techniques to exploit introspection accelerator capabilities.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 funding increased compared to FY 2024 by \$62.674 million due to consolidation of the Cyber Defense Technologies and the Cyber Offense Technologies thrusts into a single Cyber Offensive and Defensive Technologies thrust.</p>				
<b>Accomplishments/Planned Programs Subtotals</b>		56.570	65.335	62.674
<b>C. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				
<b>D. Acquisition Strategy</b>				
Not applicable				

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 2					<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>				<b>Project (Number/Name)</b> 62OMMS / <i>Research Site Support</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
62OMMS: <i>Research Site Support</i>	-	23.357	27.312	26.389	0.000	26.389	26.927	26.469	29.454	30.028	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The Air Force Research Laboratory Information Directorate leads the discovery, development and implementation of information science and technology to drive transformation within the Department of the Air Force and across the Department of Defense. The focus of the work is to provide the warfighter with the required technology-based capabilities to defend the Nation by unleashing the power of innovative information science and technology to anticipate, find, fix, track, target, engage, and assess anything, anytime, anywhere. Since the site is a single-purpose location which is not located on a military installation, the Information Directorate has unique requirements for supporting its science and technology mission. As the host unit, the directorate is responsible to provide the Rome Research Site infrastructure at Rome, New York and provide for the continued operations of all Rome Research Site properties, buildings, and services necessary for the research mission. Operations include: logistics and communication services, utilities, maintenance of facilities and structures, safety and security of the workforce and visiting researchers, and ensures compliance with the laws, regulations, and directives that pertain to site operations. These services are host unit responsibilities and are necessary to provide a safe and effective environment for the Research Site's workforce and mission.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Rome Research Infrastructure	23.357	27.312	26.389
<b>Description:</b> Provide the necessary services and support including, but not limited to: fire inspections, refuse collection, water, electricity, steam, heat, custodial, and grounds maintenance services to the Research Site. Provide the necessary support for the maintenance and repair of Research Site facilities (buildings and other structures), vehicle and equipment lease and security/safety inspections and services as necessary for compliance and safety/security of personnel and research assets. Provide the Research Site with long haul communications (using the Government Services Administration set of Networx contracts for Continental United States), trunk connectivity and wireless communications.			
<b>FY 2024 Plans:</b>			
Continue providing civilian payroll and non-pay costs for installation operations in support of the Rome Research Site property and all onsite personnel. Continue providing facilities, facility operations, facility sustainment, support equipment, contracts, and associated costs to plan, manage and execute the following functions: fire prevention, disaster preparedness, plant operation and purchase of commodity, refuse collection, pavement clearance of snow and ice, grounds maintenance including landscaping, real property special inspections, pest control, and custodial services. Continue providing Real Property Management and Engineering Services, including: (1) Facility Management and Administration and (2) Installation Engineering Services. Facility Management includes public works management costs, contract management, material procurement, facility data management, furnishings management costs, and real estate management. Installation Engineering Services includes annual inspection of facilities, master planning, overhead of planning and design, overhead of construction management, and non-Site Recovery Management service			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 2	<b>R-1 Program Element (Number/Name)</b> PE 0602788F / <i>Dominant Information Sciences and Methods</i>	<b>Project (Number/Name)</b> 62OMMS / <i>Research Site Support</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>calls. Continue providing basic installation communication services, including long haul trunk and telecommunications services. Continue providing site vehicle lease for logistics, security, and mission support under the Government Services Administration.</p> <p><b><i>FY 2025 Plans:</i></b></p> <ul style="list-style-type: none"> <li>- Continue providing civilian payroll and non-pay costs for installation operations in support of the Rome Research Site property and all onsite personnel.</li> <li>- Continue providing facilities, facility operations, facility sustainment, support equipment, contracts, and associated costs to plan, manage and execute the following functions: fire prevention, disaster preparedness, plant operation and purchase of commodity, refuse collection, pavement clearance of snow and ice, grounds maintenance including landscaping, real property special inspections, pest control, and custodial services.</li> <li>- Continue providing Real Property Management and Engineering Services, including: (1) Facility Management and Administration and (2) Installation Engineering Services. Facility Management includes public works management costs, contract management, material procurement, facility data management, furnishings management costs, and real estate management. Installation Engineering Services includes annual inspection of facilities, master planning, overhead of planning and design, overhead of construction management, and non Site Recovery Management service calls.</li> <li>- Continue providing basic installation communication services, including long haul trunk and telecommunications services.</li> <li>- Continue providing site vehicle lease for logistics, security, and mission support under the Government Services Administration.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 funding decreased as compared to FY 2024 by \$0.923 million. Justification for the decrease is described in the plans above.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	23.357	27.312	26.389

**C. Other Program Funding Summary (\$ in Millions)**  
N/A

**Remarks**

**D. Acquisition Strategy**  
Not applicable

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	144.712	255.855	248.506	0.000	248.506	283.896	300.599	311.636	318.155	Continuing	Continuing
630320: <i>Air Force Vanguard</i> s	-	144.712	255.855	248.506	0.000	248.506	283.896	300.599	311.636	318.155	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This Program is a concentrated effort to improve Air Force Research Laboratory (AFRL) business practices to accelerate moving emerging technologies into the hands of the warfighter. Vanguard programs draw the operational, acquisitions, and technology communities together into coherent teams to solve the hard Science & Technology (S&T) problems based on Department of the Air Force (DAF) strategic priorities which do not have readily available emerging technology solutions. Teams follow a disciplined process tailorable to accelerate efforts as deemed necessary by the department. This process (known as WARTECH, for WARfighter / TECHnologist) leverages discrete progress gates to deliver S&T efforts organized as Vanguard Pathfinders, Vanguard Prospects, and Vanguard. This construct organizes these multi-disciplinary, capability-focused investments based on characteristics such as effort maturity, established military utility, technical viability and transitionability. Each have built-in off-ramps to promote transition. The process is overseen by an Executive Committee, whose membership includes the DAF Technical Leadership (TEO, HAF/ST, and USSF/STR), operational requirements representatives (HAF A5/7, USSF S5B), and acquisitions communities (SAF/AQR, SAF/SQT).

Vanguard Pathfinders are focused thrust areas which comprise of numerous, exploratory efforts intended to establish military utility and technical viability of concepts under exploration. Extensive socialization occurs within these efforts to inform activities inherent to these emerging investment areas. Concept socialization activities include but are not limited to the codification of the operational champion, planning engagements with other government R&D, exploratory outreach to industry and other non-traditional partners, and the initial identification of potential transition partners. These investments seek to identify and integrate emerging applied research efforts from government labs and/or industry into integrated technology demonstrations. Vanguard pathfinder teams seek to bring appropriate communities together to answer the question "are we solving the right problem" while establishing technical viability of the concepts under consideration. This phase can be accelerated or bypassed for efforts with well understood operational requirements and concepts with established technical viability. Pathfinders serve as the pipeline for DAF's future Vanguard Prospects and Vanguard.

Vanguard Prospects focus on maturing contributing technologies in accordance with the technical objectives of the effort while further engaging acquisitions communities and industry partners. Teams draw in technologies from multiple sources and ensure use of the right technologies. By establishing fielding strategies, teams solve the problem in a transitionable way. Vanguard Prospects provide focused S&T investment to accelerate the maturation of contributing technologies while laying the foundation for full Vanguard status or a Program.

Vanguard build on the foundational work of the earlier stages, maturing and integrating contributing technologies to demonstrate solutions to the department's most pressing S&T problems based on DAF strategic requirements. Vanguard Programs - high risk by design - are focused, Secretary of the Air Force priority initiatives with

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

enterprise commitment. They are commissioned by the Assistant Secretary of the Air Force for Acquisition, Technology and Logistics, the Vice Chief of Staff of the Air Force, and the Vice Chief of Space Operations as DAF investments.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities.

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	163.887	255.855	270.984	0.000	270.984
Current President's Budget	144.712	255.855	248.506	0.000	248.506
Total Adjustments	-19.175	0.000	-22.478	0.000	-22.478
• 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	-5.000	0.000			
• SBIR/STTR Transfer	-4.193	0.000			
• Other Adjustments	-9.982	0.000	-22.478	0.000	-22.478

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 630320: *Air Force Vanguard*s

Congressional Add: *Program increase - automated geospatial intelligence detection algorithms*

Congressional Add Subtotals for Project: 630320

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	0.000	-
	0.000	-
	0.000	-

**Change Summary Explanation**

Decrease in FY 2025 funding is due to Air Force funding re-prioritization.

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> WARTECH	0.743	5.590	11.089
<b>Description:</b> The Department of the Air Force needs to provide game-changing leap-ahead capabilities to meet future force designs. This effort identifies transformational science and technology investment opportunities through the WARfighter-			



**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>TECHnologist (WARTECH) process. The WARTECH process enables the DAF enterprise to collaboratively translate future force design priorities and requirements into targeted multi-disciplinary science and technology investments.</p> <p>WARTECH accelerates capability development and responds to emerging technology opportunities by supporting integrated concept exploration. These investments support activities such as mission thread analyses to demonstrate military utility and software and hardware feasibility assessments. Select efforts will evolve into either a Vanguard Pathfinder to allow for further assessment and maturation or be designated a Vanguard Prospect or Vanguard indicating enterprise-level priority.</p> <p><b>FY 2024 Plans:</b> Initiate activities to mature and demonstrate advanced technology solutions, components and sub-system prototypes and models to accomplish successful large-scale widely distributed all-domain warfighter operations. Initiate activities to explore technologies that support achieving all-domain moving target engagement at scale in challenging operational environments. Continue activities exploring sensing technologies, investigating algorithm development to support battle management and command and control solutions, exploring alternative position navigation and timing techniques, and exploring technology development and production of low-cost and high-speed weapons. Continue activities exploring technologies supporting offensive and defensive capabilities.</p> <p><b>FY 2025 Plans:</b> - Continue activities performing modeling, simulation, and analyses assessing the military utility of candidate Transformational Component investments - Continue assessments informing decisions to promote candidate technologies into the WARTECH process - Initiate partnering and leveraging of subject matter expertise from federally-funded research and development centers, university-affiliated research centers, and other government agencies to advise and support technological ideation during the WARTECH process</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$5.499 million due to transfer of FY 2024 funding into newly established Vanguard Prospects CRONUS and E-Gon within this Program.</p>				
<p><b>Title:</b> Navigation Technology Satellite 3 (NTS-3)</p> <p><b>Description:</b> The Vanguard, Navigation Technology Satellite 3, develops and demonstrates advanced space-based navigation system technologies to provide resilient navigation support in contested environments. The demonstration includes a space-based test vehicle, ground-based enterprise command and control, and agile software defined receivers for the user.</p> <p><b>FY 2024 Plans:</b></p>		10.877	5.173	4.004

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Complete pre-launch activities. Initiate and complete launch of satellite and early orbit operations. Initiate on-orbit experimentation, including multiple simulated operational test events through both receivers in the field and on-orbit transmitted signals. Initiate experimentation towards defined mission objectives. Continue supporting transition of the overall system for conduct of residual use activities.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue on-orbit experimentation, including multiple simulated operational test events through both receivers in the field and on-orbit transmitted signals</li> <li>- Continue experimentation of defined mission objectives</li> <li>- Continue supporting transition of the overall system for conduct of residual use activities</li> <li>- Initiate transition of the system for residual use</li> <li>- Initiate experimental data analysis and composition of final report</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$1.169 million due to completion of pre-launch and launch activities.</p>				
<p><b>Title:</b> Skyborg</p> <p><b>Description:</b> Skyborg is an autonomous, attritable vehicle architecture suite which will enable the Air Force to posture, produce and sustain multi-mission sorties at sufficient tempo to thwart adversary attempts at quick, decisive action in contested and highly contested environments. Skyborg is organized into three main lines of effort (LOEs). LOE 1 develops, demonstrates, and prototypes the Autonomy Core System (ACS) consisting of Skyborg autonomy architecture and software, enabling machine and manned-unmanned teaming, while also ensuring openness, modularity, and expandability of the Skyborg autonomy mission systems suite. The ACS LOE also develops, demonstrates, and prototypes the hardware components and Open Architecture standards needed to allow modular sensor, communication, and other payload integration into the Skyborg autonomy and vehicle architectures in systems integration laboratories and platforms. LOE 2 (Low-cost vehicles) develops, demonstrates, and prototypes new low cost attritable vehicle concepts and technologies for expeditionary mass generation including sortie generation employment concepts. LOE 3 (Operational Experimentation) conducts analysis and experimentation on concepts of operations and concepts of employment for attritable, autonomous, unmanned systems and assesses the openness, and modular capabilities / sensors integration for autonomous, attritable, aircraft and mission systems.</p> <p><b>FY 2024 Plans:</b> Skyborg technology transitioned to USAF Program of Record.</p> <p><b>FY 2025 Plans:</b></p>		42.508	0.000	0.000

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
Not applicable				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not applicable				
<b>Title:</b> Golden Horde		17.131	0.000	0.000
<b>Description:</b> Integrate networked collaborative technologies into selected inventory weapon systems. Technologies can include new payloads, weapon datalinks/radios, and autonomous behaviors that are bounded by operator-defined mission rules of engagement. Supports the integration of Air Force weapons into the Joint All-Domain Command/Control network. Develop new standard software and hardware architecture environment to accelerate change for new weapon systems. This environment will integrate new concept designs via simulations, virtual and live testing, and operational analysis, experiments and war games to show the value of collaborative weapons in increasing combat power across the spectrum of conflict. Work with Weapons Program Executive Officer to define requirements for future weapons and Concept of Operations.				
<b>FY 2024 Plans:</b> Golden Horde multi-tier digital weapon ecosystem transition to Weapons Program Executive Officer.				
<b>FY 2025 Plans:</b> Not applicable				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not applicable				
<b>Title:</b> Rocket Cargo		26.317	42.200	54.200
<b>Description:</b> The Vanguard, Rocket Cargo, is an S&T effort to leverage the multi-billion dollars of commercial investments in large reusable launch vehicles to extend the commercial rocket capabilities and create a novel DOD solution for global reach. DAF S&T efforts and resources are focused on the specific areas that are unique to military transport applications. The S&T objective is to determine the viability, performance, military utility, and business case of the commercial rocket capability. Potential investigation activities will include detailed mission and cost analyses, investigation of the harsh rocket plume interactions with landing surfaces, evaluation of rocket landing capabilities at austere sites, and human factors at landing sites. Investments will also determine the ability to airdrop cargo after reentry, will assess in-flight communications to the rocket, will test cargo environments and novel cargo "loadmaster" designs for rapid load/unload, and will evaluate rocket detectability and vulnerability.				
<b>FY 2024 Plans:</b> Continue multi-disciplinary S&T to expand commercial rocket capabilities for DOD global cargo delivery on tactical timelines. Continue investigations of rocket landing viability over a broader range of unprepared sites and non-standard landing surfaces				

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

**C. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<p>relevant to rocket delivery directly to the point of need, including landing pad material surface degradation and human factors at the landing site. Continue to leverage commercial full-scale rocket engine tests on concrete and other terrains to update computational simulations and predict landing surface degradation for DOD operations. Complete airdrop S&amp;T on container freefall aerodynamics and stability through wind tunnel experiments to anchor computational fluid dynamics (CFD) models. Initiate new airdrop S&amp;T on the high-speed separation physics for airdrop payload ejection from the rocket, including new wind tunnel capabilities. Continue to leverage commercial rocket ground testing and commercial rocket flights to determine rocket cargo environments and performance, specifically to including 2nd stage rocket reentry and landing maneuvers that are unique to rocket delivery of 30 to 100 tons cargo. Initiate new design tasks for a scheduled FY25 demonstration launch to transport 30 to 100 tons of cargo to an austere site. Initiate experiments of in-flight communications to the rocket during all phases of flight, including hypersonic reentry. Continue quantitative S&amp;T assessment of the rocket detectability and vulnerability, anchored with rocket flight data, to determine implications for military missions; incorporate these details into detailed mission analysis and the capability return on investment. Continue development of mission planning tools for tactical cargo delivery timelines. Initiate testing of rapid cargo load/unload capabilities with DOD partners and optimize these for tactical timelines and the DOD logistics mission set.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue multi-disciplinary S&amp;T to expand commercial rocket capabilities for DOD global cargo delivery on tactical timelines</li> <li>- Continue investigations of rocket landing viability over a broader range of unprepared sites and non-standard landing surfaces relevant to rocket delivery directly to the point of need, including landing pad material surface degradation and human factors at the landing site</li> <li>- Complete leveraging of commercial full-scale rocket engine tests on concrete and other terrains to update computational simulations and predict landing surface degradation for DOD operations</li> <li>- Complete airdrop S&amp;T on the high-speed separation physics for airdrop container ejection from the rocket, including wind tunnel capabilities</li> <li>- Initiate airdrop S&amp;T on the payload mid-air system deployment capabilities from an airdropped container</li> <li>- Continue to leverage commercial rocket ground testing and commercial rocket flights to determine rocket cargo environments and performance, specifically to include 2nd stage rocket reentry and landing maneuvers that are unique to rocket delivery of 30 to 100 tons cargo</li> <li>- Complete design tasks for a scheduled FY25 demonstration launch to transport 30 to 100 tons of cargo to an austere site</li> <li>- Initiate tasks for flight readiness and delivery site CONOPS for a demonstration launch to transport 30 to 100 tons of cargo to an austere site</li> <li>- Continue experiments of in-flight communications to the rocket during all phases of flight, including hypersonic reentry</li> <li>- Continue quantitative S&amp;T assessment of the rocket detectability and vulnerability, anchored with rocket flight data, to determine implications for military missions; incorporate these details into detailed mission analysis and the capability return on investment</li> <li>- Continue development of mission planning tools for tactical cargo delivery timelines</li> </ul>			

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p>- Continue testing of rapid cargo load/unload capabilities with DOD partners and optimize these for tactical timelines and the DoD logistics mission set</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$12.000 million. This funding increase is due to initiation of flight readiness and delivery site readiness tasks for a scheduled FY25-26 demonstration launch. Additionally, initiation of new airdrop S&amp;T on payload mid-air system deployment capabilities from an airdropped container, including wind tunnel test campaigns and computational simulations.</p>			
---	--	--	--

<b>Title:</b> Vanguard Prospect - Resolute Sentry	12.825	30.325	20.353
---	--------	--------	--------

**Description:** The Vanguard Prospect, Resolute Sentry, provides real-time multi-domain battlespace awareness in highly contested environments. Develops and demonstrates autonomy foundation integrated software and hardware capabilities that enable cross-domain, cross-platform Intelligence, Surveillance, and Reconnaissance (ISR) via autonomous platforms at the tactical edge in communications degraded and denied environments. Resolute Sentry fuses information from multiple off-board sources with on-board and networked sensors to provide higher fidelity information to the joint force as part of the Sensing Grid feed to the Joint All Domain Command and Control capability. Resolute Sentry leverages Open Mission Systems and Sensor Open Systems Architectures to maximize platform compatibility.

**FY 2024 Plans:**  
Continue assessments, development and maturation, integration, and testing of advanced sensor fusion, robust communications, and platform orchestration technologies integrated with advanced computing hardware for autonomous unmanned systems at the tactical edge. Continue modeling, simulation, and analysis of system design trades and Model Based System Engineering activities for the air domain. Continue existing technology maturation plans for sensing systems integration for the air domain, platform data fusion integration and orchestration, and advanced analytics for on-board autonomous systems, systems trades analyses, and software integration. Initiate software development and maturation of software/hardware mission management and multi-platform autonomous system orchestration efforts with industry for integration into the Systems Integration Laboratory/Hardware Integration Laboratory. Initiate software development interfaces with off-board systems connected to Joint All-Domain Command and Control enterprise. Continue integration of robust communications applications with industry for highly contested environments. Continue integrated systems testing and demonstration planning on experimentation platforms. Initiate hardware purchases for multi-platform flight testing and operational demonstration. Continue Systems Integration Laboratory/Hardware Integration Laboratory, ground, and flight test planning and events supporting system verification and validation activities. Continue transition analysis, planning and documentation of the overall system.

**FY 2025 Plans:**

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<ul style="list-style-type: none"> <li>- Continue assessments, development and maturation, integration, and testing of advanced sensor fusion, robust communications, and platform orchestration technologies integrated with advanced computing hardware for autonomous unmanned systems at the tactical edge</li> <li>- Continue modeling, simulation, and analysis of system design trades and Model Based System Engineering activities for the air domain</li> <li>- Continue technology maturation of sensing systems integration, platform data fusion integration and orchestration, and advanced analytics for on-board autonomous systems, systems trades analyses, and software integration</li> <li>- Continue software development and maturation of software/hardware mission management and multi-platform autonomous system orchestration efforts with industry for integration into the Systems Integration Laboratory/Hardware Integration Laboratory</li> <li>- Continue software development interfaces with off-board systems connected to Joint All-Domain Command and Control enterprise</li> <li>- Continue integration of robust communications applications with industry for highly contested environments</li> <li>- Continue integrated systems testing and demonstration planning on experimentation platforms</li> <li>- Complete hardware purchases for multi-platform flight testing and operational demonstration</li> <li>- Continue Systems Integration Laboratory/Hardware Integration Laboratory, ground, and flight test planning and events supporting system demonstration and transition activities</li> <li>- Continue transition analysis, planning and documentation of the overall system</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$9.972 million due to reduced number of software development and maturation performers and reduction of hardware purchasing.</p>			
---	--	--	--

<p><b>Title:</b> Vanguard Prospect - Long Range Kill Chain</p> <p><b>Description:</b> The Vanguard Prospect, Long Range Kill Chain is prototyping and testing advanced techniques that utilize data sources from all domains to form and maintain the best possible targeting information against challenging adversary threats. This effort matures key special communications techniques and hardware required to utilize the assembled targeting information in tactically relevant timelines. The hardware and techniques matured under this effort will be inserted into the end-to-end Hawkeye kill chain.</p> <p><b>FY 2024 Plans:</b> Complete development of special communications equipment and technologies suitable for transmitting and receiving fused target data to and from tactically relevant platforms, including over-the-air demonstrations. Initiate demonstrations of over-the-air</p>	4.344	25.882	5.300
---	-------	--------	-------

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>performance of special communications techniques with a specific radio intended for use in selected tactical platforms, including assessment against known and anticipated adversary threats.</p> <p><b>FY 2025 Plans:</b> -Complete demonstration of over-the-air performance of special communications techniques with a specific radio intended for use in selected tactical platforms, including assessment against known and anticipated adversary threats</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$20.582 million due to completion of communications equipment development.</p>			
<p><b>Title:</b> Vanguard Prospect - Area Effects Demonstration</p> <p><b>Description:</b> The Vanguard Prospect, Area Effects Demo, advances the development of high-speed area effects concepts. The effort consists of modeling and simulation conducted in conjunction with aerodynamic ground and flight testing to validate the modeling tools. The physics-based computations and ground testing provide risk reduction for future high-speed vehicle concepts.</p> <p><b>FY 2024 Plans:</b> Continue validating modeling and simulation tools using data obtained through ground testing of various flight-representative components. Complete the design and fabrication of the experimental test vehicle as well as the design, fabrication, and integration of the area effects concept. Initiate flight test integration activities to include software in the loop testing; hardware in the loop testing; environmental testing; and other form, fit, function, and acceptance testing. Initiate a flight test demonstrating the area effects concept. Using the flight test results, evaluate the accuracy of the pre-test simulations and inform future tool development efforts.</p> <p><b>FY 2025 Plans:</b> - Complete validating modeling and simulation tools using data obtained through ground testing of various flight-representative components. - Complete flight test integration activities to include software in the loop testing; hardware in the loop testing; environmental testing; and other form, fit, function, and acceptance testing - Complete flight testing, demonstrating the area effects concept - Complete post-test analysis using the flight test results, evaluate the accuracy of the pre-test simulations and inform future tool development efforts</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	10.112	18.247	10.950

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 funding decrease compared to FY 2024 by \$7.297 million due to completion of design and fabrication of flight test hardware.				
<p><b>Title:</b> Vanguard Prospect - Fight Tonight</p> <p><b>Description:</b> The Vanguard Prospect, Fight Tonight, develops and demonstrates a transformational gaming engine and Artificial Intelligence based military planning capability enabling the Department of the Air Force to develop, assess, and continuously adapt the employment of combat power at the pace and scale needed for peer conflict, achieving decision advantage across highly dynamic and contested environments.</p> <p><b>FY 2024 Plans:</b> Complete development of software capability for theater scale plans rehearsal and analysis of plan options. Complete development of plan adaptation from real-time data feeds. Complete development of scalability and performance improvements to match pace and scale of target environment. Continue human-AI teaming assessment and apply findings to optimize system. Continue demonstration of operational level planning capability on representative classified network and data, scaling software for digital plan rehearsal and plan adaptation and integrate with existing data used for operational mission. Initiate Systems Integration Laboratory deployment and user-driven assessment of software system effectiveness with Department of the Air Force operational planners. Continue and accelerate transition planning of the software systems addressing critical process and technology gaps.</p> <p><b>FY 2025 Plans:</b> - Complete human-AI teaming assessment and apply findings to optimize system - Continue demonstration of operational level planning capability on representative classified network and data, scaling software for digital plan rehearsal and plan adaptation and integrate with existing data used for operational mission - Continue Systems Integration Laboratory deployment and user-driven assessment of software system effectiveness with Department of the Air Force operational planners - Continue and accelerate transition planning of the software Systems addressing critical Department of the Air Force process and technology gaps - Initiate Integration with Air Operations Center software Systems of Record</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decrease compared to FY 2024 by 35.518 million due to completion of the software development and initial demonstration of the developed capability. Results from initial demonstration will inform an upcoming decision regarding the next phase of this effort.</p>		19.855	39.118	3.600
<b>Title:</b> Vanguard Prospect - CRONUS		0.000	15.518	36.388



**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

**Description:** The objective of the Combat Refueling & Operations Networked Universal System (CRONUS) program is a technology insertion into the Next Generation Air-refueling System (NGAS) Program of Record (PoR)'s Technology Maturity and Risk Reduction (TMRR) phase. CRONUS is an operational concept which enables "fueling the fight" - delivering fuel to airborne assets where and when needed to support the joint force to include contested areas. To project combat power, an airborne platform, whether it be a counter-air, strike, or Intelligence, Surveillance, and Reconnaissance (ISR), must be able to operate within contested or highly contested operational environments. The CRONUS concept includes real-time dynamic Air Refueling Battle Management (ARBM) and Automated Air-to-Air Refueling (A3R). The CRONUS ARBM effort will provide automation to the tracking and scheduling of aerial refueling within contested areas, while the A3R effort will focus on automating the mechanical aspects of the aerial refueling process to include automated refueling and receiving equipment.

- FY 2024 Plans:**  
Early work for this effort was accomplished under the WARTECH effort within this Program in FY 2023.
- Initiate ARBM requirements analysis through direct interaction with operational battle managers leading to mission task analysis products that will inform the necessary attributes of the ARBM algorithms
  - Initiate ARBM algorithm development based on the mission task analysis products and use cases/vignettes
  - This effort will include modeling and simulation of vignettes based on inputs from Air Mobility Command (AMC)
  - Initiate model-based system engineering (MBSE) for battle management modeling
  - Initiate the design and implementation of both hardware in the loop (HIL) and software in the loop (SIL) environments
  - Continue Modeling and Simulation work under the WARTECH effort to provide operational utility analysis of the concepts developed under CRONUS. Implement operationally relevant models for communication of mission data between platforms and the ARBM
  - Initiate A3R requirements analysis to inform the derivation of attributes for the A3R system
  - Initiate modeling and simulation of A3R in relevant MBSE models, leveraging available digital engineering artifacts and expertise and developing the MS&A tools where required
  - Initiate development of the sensors, logic, and algorithms necessary for tanker-receiver pairing as part of the A3R Relative Navigation system
  - Initiate development of the fully automated mechanical system to enable automated air-to-air refueling as part of the A3R boom automation system
  - Initiate A3R program support
- FY 2025 Plans:**
- Complete ARBM requirements analysis to inform ARBM algorithm attributes

<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue ARBM algorithm development, test, and evaluation based on the modeling and simulation operational utility analysis. Implement improvements to the algorithms required to improve system level performance</li> <li>- Continue MBSE collaboration with the C3BM program office to refine the system models and capture new aspects related to the CRONUS algorithm development</li> <li>- Continue HIL/SIL environment development and implementation</li> <li>- Initiate end-to-end system testing to demonstrate the ARBM capabilities with human-in-the-loop evaluations</li> <li>- Continue Modeling and Simulation operational utility analysis based on updates/improvements of the ARBM algorithms</li> <li>- Continue A3R requirements analysis</li> <li>- Continue modeling and simulation of A3R in relevant MBSE models. Advance MBSE tool and artifact development</li> <li>- Continue the development of the sensors, logic, and algorithms necessary for tanker-receiver pairing as part of the A3R Relative Navigation system</li> <li>- Continue the development of the fully automated mechanical system to enable automated air-to-air refueling as part of the A3R boom automation system</li> <li>- Initiate certification with advanced analysis for ground testing of A3R's automated boom system</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increase compared to FY 2024 by \$20.870 million due to increased investment to full staffing of efforts, increased effort towards A3R certification testing, and ARBM system testing.</p>				
<p><b>Title:</b> Vanguard Prospect - Ephemeral Paragon (E-Gon)</p> <p><b>Description:</b> E-Gon is a comprehensive electromagnetic warfare (EW) solution being developed via open standards, utilizing adaptive/cognitive methodologies to meet the requirements of a complex and congested electromagnetic operating environment, specifically to address unknown and/or complex emitters. Rapid development, assessment, and integration of new techniques is needed to operate in an evolving electromagnetic spectrum environment which requires the ability to sense the electromagnetic spectrum and make decisions and/or recommendations based on an understanding of that environment.</p> <p><b>FY 2024 Plans:</b> Early work for this effort was accomplished under the Vanguard Pathfinder - Integrated Electronic Warfare effort within this Program in FY 2023.</p> <ul style="list-style-type: none"> <li>- Initiate maturation efforts on separate electromagnetic warfare methodologies</li> <li>- Initiate algorithm maturation and assessment to support future integration into minimum viable product</li> <li>- Initiate subsystems capabilities assessments to support minimum viable product integration and testing</li> </ul> <p><b>FY 2025 Plans:</b></p>		0.000	10.588	32.941

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue maturation efforts on electromagnetic warfare methodologies</li> <li>- Continue algorithm maturation and assessment to support integration into minimum viable product</li> <li>- Continue assessment and evaluation efforts for sub systems, and algorithms to test the minimum viable product</li> <li>- Initiate integration of subsystems, algorithms, and electromagnetic warfare methodologies towards an instantiation of the minimum viable product</li> <li>- Initiate incremental systems test and capabilities assessments of integrated components</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY2025 funding increase compared to FY2024 of 22.353 million for increased assessment and maturation of the underlying sub-systems and algorithms. Increase includes the integration of those sub-systems and assessment of overall system performance. FY2025 will utilize the frameworks established in FY2024 to assess, improve, and integrate the sub systems, systems, and algorithms required to achieve the minimum viable product which requires increases to teams and additional assessment events. An increase in engineering team size is expected for FY2025 to accomplish required technical efforts and an additional team to manage integration efforts.</p>				
<p><b>Title:</b> Analysis for Emerging Vanguard Pipeline</p> <p><b>Description:</b> Conduct operational analysis and mission thread engineering activities assessing military utility and cost-effective implementations of emerging technology opportunities under consideration in the WARTECH process.</p> <p><b>FY 2024 Plans:</b> Initiate activities performing modeling, simulation, and analyses assessing the military utility of candidate Transformational Component investments. Continue assessments informing decisions to promote candidate technologies in the WARTECH process.</p> <p><b>FY 2025 Plans:</b> This effort has been integrated into the WARTECH effort in this program.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$10.350 million. This decrease reflects the integration of analysis activities into the WARTECH effort in this program.</p>		0.000	10.350	0.000
<p><b>Title:</b> Vanguard Pathfinder - Integrated Electronic Warfare</p> <p><b>Description:</b> The Department of the Air Force has a need to identify, protect against and counter any use of electromagnetic spectrum (EMS) effects as well as naturally occurring phenomena that degrade, neutralize, or destroy friendly combat capability. This effort identifies, assesses, integrates, and demonstrates material and non-material solutions to support EMS protection and</p>		0.000	12.412	12.926

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>survivability of air and space platforms, personnel, systems, systems of systems, and equipment. This effort includes algorithm and tool development with modeling, simulation and analysis and hardware-in-the loop testing.</p> <p><b><i>FY 2024 Plans:</i></b> Initiate activities assessing, integrating, and demonstrating advanced electronic warfare technology solutions, components and sub-systems, to accomplish warfighter relevant engagements at scale. Initiate implementation of open, flexible, and reprogrammable hardware and software architectures, applications and algorithms that enable threat environment data collection and analysis/synthesis to assess operationally optimized situational awareness and demonstrate countermeasures, waveforms/techniques against modern and emerging threats in challenging electromagnetic (EM) spectrum operating environments. Initiate activities integrating, demonstrating, and advancing the technical maturity of software algorithms, adaptive techniques and autonomy-based approaches and assess awareness of and responses to threats across the EM spectrum. These activities include the integration and demonstration of hardware and software applications and algorithms in simulated environments and field experiments.</p> <p><b><i>FY 2025 Plans:</i></b>                      - Continue activities assessing, integrating, and demonstrating advanced electronic warfare technology solutions, components and sub-systems, to accomplish warfighter relevant engagements at scale                      - Continue implementation of open, flexible, and reprogrammable hardware and software architectures, applications and algorithms that enable threat environment data collection and analysis/synthesis to assess operationally optimized situational awareness and demonstrate countermeasures, waveforms/techniques against modern and emerging threats in challenging electromagnetic (EM) spectrum operating environments                      - Continue activities integrating, demonstrating, and advancing the technical maturity of software algorithms, adaptive techniques and autonomy-based approaches and assess awareness of and responses to threats across the EM spectrum. These activities include the integration and demonstration of hardware and software applications and algorithms in simulated environments and field experiments                      -Initiate modeling and simulation from material to vehicle to identify and mature EMS protection and integrate data into applicable program offices                      -Initiate system, subsystem, and component level testing to baseline performance EMS protection material performance                      -Initiate integration of EMS protection and survivability techniques and principles within select systems of interest                      -Initiate technical transition into industry for application into component and warfighter systems                      -Initiate technology demonstration and training aid capabilities to develop tactics, training, and procedures for aircrew and platforms to operate in and around EMS threat contested environments</p> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b></p>			

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 funding increased compared to FY 2024 by \$0.514 million as described in the plans above.				
<b>Title:</b> Vanguard Pathfinder - Integrated Networks		0.000	12.502	10.878
<p><b>Description:</b> The Department of the Air Force has a need to communicate with Joint and Coalition partners and to provide battle management during complex military operations. This effort identifies and assesses accessible, resilient, and secure bi-directional information exchange technology solutions, components, and sub-systems, to enable seamless movement of data to the right place at the right time informing effective decision making on military relevant timescales. Efforts support the integration of applications and algorithms into flexible hardware and software architectures to achieve movement of appropriate data across multiple security levels, and modeling and simulation to assess information exchanges for large-scale all-domain warfighter operations.</p> <p><b>FY 2024 Plans:</b> Initiate efforts identifying technology in the areas of next-generation cross domain solutions incorporated into flexible networking architectures demonstrating the technical feasibility of improved communication methods. Initiate supporting emulation efforts establishing the scalability of emerging technologies. These activities may include the integration and demonstration of hardware and software applications and algorithms in simulated environments and field experiments.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue development of next-generation cross domain solutions through design and prototyping</li> <li>- Continue ground emulation evaluation of hardware and software applications received from selected vendors to assess scalability of emerging technologies. Emulation environment to include hardware and software necessary to optimally route mission data across multiple security levels and heterogenous networks</li> <li>- Initiate the MS&amp;A integration with multi-domain data transport efforts to assess how networks from multiple domains enhance aerial network &amp; kill-chain in complex information security use cases to identify risks, challenges and synergies. Assess scalability to large number of network nodes in air and mission performance under various network conditions</li> <li>- Initiate integration of software and hardware designs to address any deficiencies discovered during ground simulations</li> <li>- Initiate integrated demonstration planning</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$1.624 million. This decrease is due to requirement for further analysis ensuring technical scope complies with the transformational capability assessment.</p>				
<b>Title:</b> Vanguard Pathfinder - Enabling Technology for Agile Basing		0.000	13.000	0.000

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>Description:</b> The Department of the Air Force is evaluating agile basing concepts to prepare against threats to its forward operating bases from evolving adversary capabilities. This effort encompasses assessment and maturation of technologies that will enhance survivability in agile basing scenarios.</p> <p><b>FY 2024 Plans:</b> Initiate activities developing technologies and metrics evaluating effectiveness of technologies for improving resilience of agile operating bases. Initiate efforts maturing capabilities that invoke a combination of techniques and technologies in support of agile basing defense, enable modeling and simulation to assess their effectiveness and vulnerabilities.</p> <p><b>FY 2025 Plans:</b> Technologies within this topic area have been identified as requiring further applied research maturation.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 funding by 13.000 million due to higher priorities within this program.</p>				
<p><b>Title:</b> Vanguard Pathfinder - Advanced Emulation for Test and Training</p> <p><b>Description:</b> The Department of Air Force has a need to prepare our forces for joint military operations through simulation of major conflicts and training activities. This effort integrates, assesses and demonstrates mature science and technology solutions supporting test and training in the synthetic environment to enable future force operations.</p> <p><b>FY 2024 Plans:</b> Initiate development and demonstration of a Synthetic Operational Test and Training Infrastructure capability to support test, training, and experimentation for multi-domain operations by integrating high-fidelity command and control functions with existing test and training infrastructure. Initiate cross disciplinary research for autonomous collaborative platform development to further enhance system integration laboratory supporting next-generation autonomy.</p> <p><b>FY 2025 Plans:</b> - Continue development and demonstration of a Synthetic Operational Test and Training Infrastructure capability to support test, training, and experimentation for multi-domain operations by integrating high-fidelity command and control functions with existing test and training infrastructure - Continue cross disciplinary research for autonomous collaborative platform development to further enhance system integration laboratory supporting next-generation autonomy</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$3.185 million due to higher priority efforts within this program.</p>		0.000	14.950	11.765
<p><b>Title:</b> Vanguard Pathfinder - Integrated Combat Effects</p>		0.000	0.000	34.112

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

**Description:** The Department of the Air Force has a need to pursue leap ahead technologies to enable offensive and defensive, warfighting combat effects. Investments should develop, assess and demonstrate standoff capabilities with increased responsiveness and affordability to jointly deter or blunt peer-adversary offensive operations. This effort integrates and demonstrates affordable long-range missile technologies for transition to diverse future joint weapon systems. Key attributes of these concepts will enable survivable, affordable, and effective kinetic and non-kinetic capabilities. Efforts support the integration of these concepts for large-scale warfighter operations in contested environments.

This effort is not a new start but breaks out activities previously identified under the WARTECH effort in this program into a discrete effort for further investment.

**FY 2024 Plans:**  
In FY 2024 activities for this effort were executed within the WARTECH effort in this Program.

- FY 2025 Plans:**
- Initiate the investigation of selected weapon component technologies for further maturation and subsystem integration
  - Initiate the design and development of range- and lethality-enhancing subsystem technologies
  - Initiate the design of new weapon concepts leveraging enhanced component/subsystem technologies
  - Initiate investigation of applicable low-cost, high-volume manufacturing technologies
  - Continue activities to mature and demonstrate advanced technology solutions, components and sub-system prototypes and models to accomplish successful large-scale widely distributed all-domain warfighter operations (previously executed under WARTECH effort in this program)
  - Continue activities to explore technologies that support achieving all-domain moving target engagement at scale in challenging operational environments (previously executed under WARTECH effort in this program)
  - Continue activities exploring production of low-cost and high-speed weapons (previously executed under WARTECH effort in this program)
  - Continue activities exploring technologies supporting offensive and defensive capabilities (previously executed under WARTECH effort in this program)
  - Initiate development of target and behavior models using predictive analytics
  - Initiate technologies providing near-real time situation awareness using data fusion from multi-domain sources
  - Initiate efforts to integrate data across the Information Environment into a common data fabric providing access to and analysis of all of the data that exists within the AF information environment
  - Initiate development of artificial intelligence / machine learning - enabled analytic tools and capabilities to automate common tasks, characterize the information battlespace, and assess the effects of information warfare operations

<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603032F / <i>Future AF Integrated Technology Demos</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
- Initiate efforts to link disparate information warfare sub-disciplines to deliberately target and affect human and system behavior; develop integrated information warfare planning tools and capabilities to synchronize information warfare effects - Initiate investments in partnerships and alliances that expand USAF information warfare capabilities and capacity to fulfill information warfare gaps and requirements  <b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 funding increased compared to FY 2024 by \$34.112 million. This increase establishes the activities necessary to continue these transformational capability maturation efforts which initiated in FY 2024 under the WARTECH effort within this program.			
<b>Accomplishments/Planned Programs Subtotals</b>	144.712	255.855	248.506

	FY 2023	FY 2024
<b><i>Congressional Add:</i></b> Program increase - automated geospatial intelligence detection algorithms	0.000	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressionally directed efforts.		
<b>Congressional Adds Subtotals</b>	0.000	-

**D. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

Not applicable



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	53.164	30.372	29.661	0.000	29.661	31.291	32.873	34.938	35.734	Continuing	Continuing
632100: <i>Laser Hardened Materials</i>	-	19.545	15.957	13.580	0.000	13.580	13.689	14.034	14.654	15.026	Continuing	Continuing
633153: <i>Non-Destructive Inspection Development</i>	-	5.134	5.178	4.573	0.000	4.573	4.725	4.822	4.996	5.101	Continuing	Continuing
633946: <i>Materials Transition</i>	-	28.485	9.237	11.508	0.000	11.508	12.877	14.017	15.288	15.607	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops and demonstrates advanced materials and process technologies to satisfy Department of the Air Force requirements in areas such as survivability, readiness, affordability, and new processes and materials. These projects ensure the Department of the Air Force weapon systems are ready and able when needed.

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 the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>
--	--

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	49.765	30.372	32.704	0.000	32.704
Current President's Budget	53.164	30.372	29.661	0.000	29.661
Total Adjustments	3.399	0.000	-3.043	0.000	-3.043
• 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	6.042	0.000			
• SBIR/STTR Transfer	-1.478	0.000			
• Other Adjustments	-1.165	0.000	-3.043	0.000	-3.043

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project: 632100: *Laser Hardened Materials***

Congressional Add: *Program increase - advanced aerospace materials technology development and testing*

Congressional Add Subtotals for Project: 632100

	<b>FY 2023</b>	<b>FY 2024</b>
Congressional Add Subtotals for Project: 632100	9.703	0.000
Congressional Add Subtotals for Project: 633946	9.703	0.000
Congressional Add Subtotals for Project: 633946	4.851	0.000
Congressional Add Subtotals for Project: 633946	14.554	0.000
Congressional Add Totals for all Projects	24.257	0.000

**Project: 633946: *Materials Transition***

Congressional Add: *Program increase - Metals Affordability Research*

Congressional Add: *Program increase - polymer printing technology for additive manufacturing*

Congressional Add Subtotals for Project: 633946

Congressional Add Totals for all Projects

**Change Summary Explanation**

Decrease in FY 2025 funding is due to movement of some work to Unites States Space Force Research, Development, Test & Evaluation program.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>				<b>Project (Number/Name)</b> 632100 / <i>Laser Hardened Materials</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
632100: <i>Laser Hardened Materials</i>	-	19.545	15.957	13.580	0.000	13.580	13.689	14.034	14.654	15.026	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates advanced materials technologies that enhance protection for Department of the Air Force personnel to ensure safety and to enable them to perform required missions in threat environments. Advanced materials technologies also enhance protection for Department of the Air Force sensors and systems to ensure safety, survivability, and operability in threat environments.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Aerospace Systems Protection	5.466	10.372	8.442
<b>Description:</b> Develop and demonstrate materials technologies that enhance hardening for sensors, avionics, and components to increase survivability and mission effectiveness of Department of the Air Force systems.			
<b>FY 2024 Plans:</b> Continue validating and assessing the demonstrated results and transition the use of protection technologies for future sensor designs and strategies to mitigate directed energy damage for visual/near, short-wave, and mid-wave infrared detectors. Continue transitioning technologies and integrate the developments into light, operator friendly survivable electro-optic sensors that provide full spectrum protection for missile warning. Continue analyzing the high-performance properties of damage limiting semiconductor materials designed to harden electro-optic imaging sensors. Continue transitioning developed laser countermeasures for survivability of dynamic electro-optic/infrared imagers. Continue advancing the employment and integration of evolved computational materials science to model materials characteristics to increase accuracy and shorten design cycle time of coatings development for use in sensor hardening. Continue development of materials for survivable next generation aircraft sensor systems.			
<b>FY 2025 Plans:</b> - Continue validating and assessing the demonstrated results and transition the use of protection technologies for future sensor designs and strategies to mitigate directed energy damage for visual/near, short-wave, and mid-wave infrared detectors. - Continue transitioning technologies and integrate the developments into light, operator friendly survivable electro-optic sensors that provide full spectrum protection for missile warning. - Continue analyzing the high-performance properties of damage limiting semiconductor materials designed to harden electro-optic imaging sensors. - Continue developing of materials for survivable next generation aircraft sensor systems.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>	<b>Project (Number/Name)</b> 632100 / <i>Laser Hardened Materials</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Complete development of laser countermeasures for survivability of dynamic electro-optic/infrared imagers.</p> <p>- Complete employment and integration of evolved computational materials science to model materials characteristics to increase accuracy and shorten design cycle time of coatings development for use in sensor hardening.</p> <p>- In FY 2025 and beyond work in hardening for space-based platforms will be accomplished in 3620F: Research, Development, Test &amp; Evaluation, Space Force; Program 1206616SF: Space Advanced Technology Development/Demo; Project 633834: Project Integrated Space Technology Demonstrations; Effort: Advanced Materials for Spacecraft Resilience</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$1.930 million. Funding decrease is due to increased emphasis on agile protection technologies and movement of \$3.102 million of hardening of spaced based platforms research to USSF program as shown in FY 2025 plans.</p>			
<p><b>Title:</b> Aircrew Protection</p> <p><b>Description:</b> Develop and demonstrate materials technologies that enhance protection for Department of the Air Force personnel to ensure safety and to enable crews to perform required missions in a threat environment.</p> <p><b>FY 2024 Plans:</b> Continue developing, validating, demonstrating, and transitioning laser protection materials and technologies for personnel protection. Complete validation and development of light-weight helmet-mounted sensor hardening materials focusing on next-generation nighttime specialized sensors. Continue advancing transition efforts and development of visor based aircrew protection materials with agile protection. Continue evaluating and assessing materials and advances in characterization and demonstration of eye protection technologies using computational materials science tools. Continue transitioning, validate, mature, and test improvements to functionality and performance of personnel protection technologies in expected operational conditions. Continue development and testing of materials technologies to protect against nuclear flash blindness.</p> <p><b>FY 2025 Plans:</b> - Continue developing, validating, demonstrating, and transitioning laser protection materials and technologies for personnel protection. - Continue advancing transition efforts and development of visor based aircrew protection materials with agile protection. - Continue evaluating and assessing materials and advances in characterization and demonstration of eye protection technologies using computational materials science tools. - Continue transitioning, validate, mature, and test improvements to functionality and performance of personnel protection technologies in expected operational conditions. - Continue development and testing of materials technologies to protect against nuclear flash blindness.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	4.376	5.585	5.138

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>	<b>Project (Number/Name)</b> 632100 / <i>Laser Hardened Materials</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 funding decreased compared to FY 2024 by \$0.447 million. Funding decrease is described in the above plans.			
<b>Accomplishments/Planned Programs Subtotals</b>	9.842	15.957	13.580

	<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Program increase - advanced aerospace materials technology development and testing	9.703	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.		
<b>FY 2024 Plans:</b> Not applicable		
<b>Congressional Adds Subtotals</b>	9.703	0.000

**C. Other Program Funding Summary (\$ in Millions)**

<u>Line Item</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u> <u>Base</u>	<u>FY 2025</u> <u>OCO</u>	<u>FY 2025</u> <u>Total</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>FY 2028</u>	<u>FY 2029</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• RDTE 03 0603112F: <i>Advanced Materials for Weapon Systems</i>	0.000	0.000	-	-	-	-	-	-	-	0.000	0.000

**Remarks**

**D. Acquisition Strategy**

N/A

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>				<b>Project (Number/Name)</b> 633153 / <i>Non-Destructive Inspection Development</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
633153: <i>Non-Destructive Inspection Development</i>	-	5.134	5.178	4.573	0.000	4.573	4.725	4.822	4.996	5.101	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates advanced nondestructive inspection and evaluation technologies to monitor performance integrity and to detect failure causing conditions in weapon systems components and materials. Nondestructive inspection and evaluation capabilities greatly influence and/or limit many design, manufacturing, and maintenance practices. This project provides technology to satisfy Department of the Air Force requirements to extend the lifetime of current systems through increased reliability and cost-effectiveness at field and depot maintenance levels. Equally important is assuring manufacturing quality, integrity, and safety requirements are built in.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Special Material Inspection Technologies	1.380	1.295	1.143
<b>Description:</b> Develop and demonstrate advanced inspection technologies supporting special material systems to enhance affordability and ensure full performance and survivability.			
<b>FY 2024 Plans:</b> Continue the transition process to depots and flight lines for improved methods to acquire and analyze data to facilitate improved characterization, registration, and tracking of degradation and damage to special materials that enables/ensures more affordable coatings assessment. Continue validating tools to improve characterization and failure modes of specialty multilayer coatings. Continue developing automation for robotic technologies for visual inspections that will realize human-assisted inspection capabilities and provide capabilities for automated multi-spectral characterization.			
<b>FY 2025 Plans:</b> - Continue the transition process to depots and flight lines for improved methods to acquire and analyze data to facilitate improved characterization, registration, and tracking of degradation and damage to special materials that enables/ensures more affordable coatings assessment. - Continue validating tools to improve characterization and failure modes of specialty multilayer coatings. - Continue developing automation for robotic technologies for visual inspections that will realize human-assisted inspection capabilities and provide capabilities for automated multi-spectral characterization.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>	<b>Project (Number/Name)</b> 633153 / <i>Non-Destructive Inspection Development</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 funding decreased compared to FY 2024 by \$0.152 million due to transitioning to depots.				
<b>Title:</b> Advanced System Monitoring Technologies		3.754	3.883	3.430
<b>Description:</b> Develop and demonstrate advanced systems status monitoring technologies to provide on-board and embedded sensing to gain continuous awareness of the state of key subsystems.				
<b>FY 2024 Plans:</b> Continue demonstrating advanced analytical methods to more accurately assess the location, and register spatial location, of damage detected using nondestructive inspection data and results. Develop augmented reality technologies to improve the process of performing non-destructive evaluation tasks, acquiring and archiving data and reporting results, and enabling improved inspector guidance and visualization. Continue development and transition of novel approaches to collect, analyze, transport, archive, and use digital nondestructive inspection data and information. Continue enhanced methods for compiling, reporting, collecting and rapidly analyzing digital nondestructive testing and evaluation data necessary for improved damage detection and characterization. Demonstrate and transition technologies to locate damage to composite structures without coating removal and to inspect composite structures with complex geometry. Continue the transition and integration of computational materials science tools to provide data necessary for life prediction methods to enable risk-based life management.				
<b>FY 2025 Plans:</b> - Continue demonstrating advanced analytical methods to more accurately assess the location, and register spatial location, of damage detected using nondestructive inspection data and results. - Continue to develop augmented reality technologies to improve the process of performing non-destructive evaluation tasks, acquiring and archiving data and reporting results, and enabling improved inspector guidance and visualization. - Continue development and transition of novel approaches to collect, analyze, transport, archive, and use digital nondestructive inspection data and information. - Continue enhanced methods for compiling, reporting, collecting and rapidly analyzing digital nondestructive testing and evaluation data necessary for improved damage detection and characterization. - Continue demonstrating and transitioning technologies to locate damage to composite structures without coating removal and to inspect composite structures with complex geometry. - Continue the transition and integration of computational materials science tools to provide data necessary for life prediction methods to enable risk-based life management.				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$0.453 million due to decreased emphasis on sustainment for aging aircraft.				
<b>Accomplishments/Planned Programs Subtotals</b>		5.134	5.178	4.573

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force Date: March 2024

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>	<b>Project (Number/Name)</b> 633153 / <i>Non-Destructive Inspection Development</i>
--	--	--

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A



**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>	<b>Project (Number/Name)</b> 633946 / <i>Materials Transition</i>
--	--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
											Continuing	Continuing
633946: <i>Materials Transition</i>	-	28.485	9.237	11.508	0.000	11.508	12.877	14.017	15.288	15.607	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates advanced materials and processing technologies for fielded and planned Department of the Air Force weapon, airframe, aerospace structure, protection, and propulsion applications. Advanced materials and processes that have matured beyond applied research are characterized, critical data are collected, and critical evaluations in the proposed operating environment are performed. This design and scale-up data improves the overall affordability of promising materials and processing technologies, providing needed initial incentives for their industrial development.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<p><b>Title:</b> Air Vehicle Materials Technologies</p> <p><b>Description:</b> Develop and demonstrate materials and processes technologies for air vehicle and subsystems to enhance lift, propulsion, power generation management, survivability, and affordability of air vehicles.</p> <p><b>FY 2024 Plans:</b> Complete development of technologies for organic engine lifing analysis for enhanced engine component risk management capability. Continue development and characterization for transitioning materials to protect next generation hardened assets. Complete microstructure sensitive lifing methodologies that lower life cycle cost and advance performance characteristics of airframe and engine components in order to start development of next generation modeling tools that incorporate residual stress effects on component life. Continue development and characterization of materials for next-generation hardened assets.</p> <p><b>FY 2025 Plans:</b> Continue development and characterization of materials for next-generation hardened assets.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$1.271 million due to increased emphasis on hardening for structures.</p>	13.931	5.237	6.508
<p><b>Title:</b> Counter Intelligence, Surveillance, and Reconnaissance Technologies</p> <p><b>Description:</b> Develop and demonstrate multiple intelligence technologies to degrade adversarial Intelligence, Surveillance, and Reconnaissance (ISR) collection and analysis to cause enemy decisions and actions which favor Department of the Air Force mission goals. This work directly supports both passive airbase defense and overall theatre operations.</p> <p><b>FY 2024 Plans:</b></p>	0.000	4.000	5.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603112F / <i>Advanced Materials for Weapon Systems</i>	<b>Project (Number/Name)</b> 633946 / <i>Materials Transition</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
Initiate developmental efforts in counter ISR technologies across multiple collection domains in a tactically coordinated way that considers all relevant operational environments. Initiate development of a closed-loop simulation in a digital test environment with a human in the loop and quantify the utility of techniques incorporating cost, size, weight and power requirements.  <b><i>FY 2025 Plans:</i></b> - Continue developmental efforts in counter ISR technologies across multiple collection domains in a tactically coordinated way that considers all relevant operational environments. - Continue development of a closed-loop simulation in a digital test environment with a human in the loop and quantify the utility of techniques incorporating cost, size, weight and power requirements.  <b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 funding increased compared to FY 2024 by \$1.000 million due to increased emphasis on counter ISR technologies.			
<b>Accomplishments/Planned Programs Subtotals</b>	13.931	9.237	11.508

	<b>FY 2023</b>	<b>FY 2024</b>
<b><i>Congressional Add:</i></b> Program increase - Metals Affordability Research <b><i>FY 2023 Accomplishments:</i></b> Conducted Congressionally directed efforts. <b><i>FY 2024 Plans:</i></b> Not applicable	9.703	0.000
<b><i>Congressional Add:</i></b> Program increase - polymer printing technology for additive manufacturing <b><i>FY 2023 Accomplishments:</i></b> Conducted Congressionally directed efforts. <b><i>FY 2024 Plans:</i></b> Not applicable	4.851	0.000
<b>Congressional Adds Subtotals</b>	14.554	0.000

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

N/A

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603199F / <i>Sustainment Science and Technology (S&amp;T)</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	17.907	10.478	12.558	0.000	12.558	12.965	13.233	13.712	13.999	Continuing	Continuing
635351: <i>Technology Sustainment</i>	-	17.907	10.478	12.558	0.000	12.558	12.965	13.233	13.712	13.999	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This program develops and demonstrates mature Air Force Research Laboratory (AFRL) sustainment technologies such as: materials, corrosion, maintenance/repair techniques, state awareness/non-destructive inspection, health management, life prediction, composite materials and logistics for transition into fielded Department of the Air Force systems to reduce life cycle sustainment costs and increase readiness. Technologies matured and demonstrated impact affordability and availability of fielded aerospace weapon systems by reducing sustainment costs, extending service life, and maintaining mission readiness and capability. This program develops and demonstrates maintenance, life cycle management, and system/fleet decision making technologies that can be implemented to address operational sustainment issues and could influence future system sustainability decisions via risk reduction to support inclusion into new systems. Studies are conducted to analyze processes and methodologies for application of technologies to address sustainment issues across the force, identifying cross cutting applications for fielded systems, and opportunities for building in sustainability into future applications. This program also develops and demonstrates affordable advanced composites for aircraft structures of fielded and emerging systems. This includes studies, analyses, and tests for application of composites to address sustainment and affordability issues across the force.

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 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603199F / <i>Sustainment Science and Technology (S&amp;T)</i>
--	---

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	10.662	10.478	12.533	0.000	12.533
Current President's Budget	17.907	10.478	12.558	0.000	12.558
Total Adjustments	7.245	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	8.033	0.000			
• SBIR/STTR Transfer	-0.360	0.000			
• Other Adjustments	-0.428	0.000	0.025	0.000	0.025

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 635351: *Technology Sustainment*

Congressional Add: *Tagless IUID*

Congressional Add: *advanced predictive analytics for supply chain risk management*

Congressional Add Subtotals for Project: 635351

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	1.940	0.000
	5.000	0.000
	6.940	0.000
	6.940	0.000

**Change Summary Explanation**

Increase in FY 2025 is due to increased emphasis in sustainment technology for future systems.

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Prevention/Enhanced Maintainability Technologies	5.699	5.449	12.558
<b>Description:</b> Develop, demonstrate, and transition maintenance and sustainment technologies to improve component design, maintenance, replacement, and concepts for performance improvement and reduced maintenance burden for the Department of the Air Force.			
<b>FY 2024 Plans:</b> Continue rapid repair and materials development for aircraft battle damage repair of advanced fighter aircraft. Continue advanced canopy technology development. Continue total body nondestructive evaluation system for outer mold line inspection of advanced fighter aircraft. Continue development of materials and processes to reduce maintenance burden on aerospace systems. Continue			

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603199F / <i>Sustainment Science and Technology (S&amp;T)</i>
--	---

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>efforts to demonstrate high reliability of repair and maintenance technologies to increase service time between maintenance actions. Continue to develop, demonstrate, and transition maintenance and sustainment technologies to improve component design, maintenance, repair, replacement, and concepts for maintainer training, extending part life, and reduced maintenance burden spanning Department of the Air Force mission areas of Air, Space, and Cyber.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue rapid repair and materials development for aircraft battle damage repair of advanced fighter aircraft.</li> <li>- Continue advanced canopy technology development. Continue total body nondestructive evaluation system for outer mold line inspection of advanced fighter aircraft.</li> <li>- Continue development of materials and processes to reduce maintenance burden on aerospace systems.</li> <li>- Continue efforts to demonstrate high reliability of repair and maintenance technologies to increase service time between maintenance actions.</li> <li>- Continue to develop, demonstrate, and transition maintenance and sustainment technologies to improve component design, maintenance, repair, replacement, and concepts for maintainer training, extending part life, and reduced maintenance burden spanning Department of the Air Force mission areas of Air, Space, and Cyber.</li> <li>- Initiate efforts to develop system fleet management decision-making tools, maintenance/repair database technologies and techniques, and supply chain/infrastructure approaches to reduce sustainment costs. These efforts span Department of the Air Force mission areas of Air, Space, and Cyber. (This moved from the Management/Improved Reliability Technologies effort within this project.)</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$7.109 million due to increased emphasis on repair and maintenance technologies that decrease service time and movement of fleet management to this effort.</p>			
<p><b>Title:</b> Management/Improved Reliability Technologies</p> <p><b>Description:</b> Develop, demonstrate, and transition technologies to improve existing and new components, fleet management/ decision-making tools, and supply chain/sustainment infrastructure to decrease downtime and costs, and increase reliability.</p> <p><b>FY 2024 Plans:</b> Continue system development to provide prognostic capabilities for avionics components and analysis techniques to extend engine component service life. Continue efforts to develop system fleet management decision-making tools, maintenance/repair database technologies and techniques, and supply chain/infrastructure approaches to reduce sustainment costs. These efforts span Department of the Air Force mission areas of Air, Space, and Cyber. Continue efforts based on competitive selection processes in FY 2021.</p> <p><b>FY 2025 Plans:</b></p>	5.268	5.029	0.000

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603199F / <i>Sustainment Science and Technology (S&amp;T)</i>
--	---

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
<ul style="list-style-type: none"> <li>- Complete system development to provide prognostic capabilities for avionics components and analysis techniques to extend engine component service life.</li> <li>- Complete efforts to develop system fleet management decision-making tools, maintenance/repair database technologies and techniques, and supply chain/infrastructure approaches to reduce sustainment costs. These efforts span Department of the Air Force mission areas of Air, Space, and Cyber.</li> <li>- Complete efforts based on competitive selection processes in FY 2021.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$5.029 million due to movement of fleet management to Prevention/Enhanced Maintainability Technologies.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	10.967	10.478	12.558

	FY 2023	FY 2024
<p><b>Congressional Add:</b> Tagless IUID</p> <p><b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts. This was originally appropriated in Line 265, Logistics Information Technology (LOGIT) PE 0708610F but moved to this program as this work does not align with Line 265 but does with this program.</p> <p><b>FY 2024 Plans:</b> Not applicable</p>	1.940	0.000
<p><b>Congressional Add:</b> advanced predictive analytics for supply chain risk management</p> <p><b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts. This was originally appropriated to DARPA Line 2 DEFENSE RESEARCH SCIENCES, 0601101E but was transferred to this program for proper execution.</p> <p><b>FY 2024 Plans:</b> Not applicable</p>	5.000	0.000
<b>Congressional Adds Subtotals</b>	6.940	0.000

**D. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

N/A

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	35.354	48.046	37.935	0.000	37.935	32.605	45.149	46.468	47.439	Continuing	Continuing
63665A: <i>Advanced Aerospace Sensors Technology</i>	-	15.108	29.373	31.268	0.000	31.268	25.771	38.303	39.372	40.195	Continuing	Continuing
6369DF: <i>Target Attack and Recognition Technology</i>	-	20.246	18.673	6.667	0.000	6.667	6.834	6.846	7.096	7.244	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

The program develops and demonstrates advanced technologies for electro-optical sensors, radar sensors and electronic counter-countermeasures, and components and algorithms. It also develops and demonstrates radio frequency (RF) and electro-optical (EO) sensors for detecting, locating, and targeting airborne, fixed, and time-critical mobile ground targets obscured by natural or man-made means. This program develops the means to find, fix, target, track, and engage air and ground targets anytime, anywhere, and in any weather. This program creates and applies artificial intelligence toolsets to ensure an asymmetric advantage for the Department of the Air Force. The program demonstrates artificial intelligence enabled autonomy to augment cognitive capabilities of our Airmen and Guardians so they can keep up with the faster pace and increased complexity of warfare. This program has been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

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 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 element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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 the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b>	<b>R-1 Program Element (Number/Name)</b>
3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	PE 0603203F / <i>Advanced Aerospace Sensors</i>

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	37.917	48.046	49.880	0.000	49.880
Current President's Budget	35.354	48.046	37.935	0.000	37.935
Total Adjustments	-2.563	0.000	-11.945	0.000	-11.945
• 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	-1.083	0.000			
• Other Adjustments	-1.480	0.000	-11.945	0.000	-11.945

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 6369DF: *Target Attack and Recognition Technology*

Congressional Add: *Modular open autonomous software testing*

Congressional Add Subtotals for Project: 6369DF

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	5.517	-
	5.517	-
	5.517	-

**Change Summary Explanation**

Decrease in FY 2025 funding is due to re-prioritization to meet the nation's future security needs.



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>				<b>Project (Number/Name)</b> 63665A / <i>Advanced Aerospace Sensors Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
63665A: <i>Advanced Aerospace Sensors Technology</i>	-	15.108	29.373	31.268	0.000	31.268	25.771	38.303	39.372	40.195	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project area develops and demonstrates aerospace sensor and processing technologies for intelligence, surveillance, reconnaissance, target, and attack radar applications in both manned and unmanned platforms, including electro-optical sensors and electronic counter-countermeasures for radars. It provides aerospace platforms with the capability to precisely detect, track, and target both airborne (conventional and low radar cross-section) and ground-based, high-value, time-critical targets in adverse clutter and jamming environments. Project activities include developing multi-function radio-frequency systems including radar and electronic warfare technology and the position and timing information to enable distributed sensing. Desired warfighting capabilities include the ability to detect concealed targets in difficult background conditions.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>Title:</b> Passive/Multi-Mode Sensing</p> <p><b>Description:</b> Develop advanced techniques and prototype passive radio frequency sensors to intercept, collect, locate and track enemy radio frequency sensor systems for intelligence, surveillance and reconnaissance of air and ground targets.</p> <p><b>FY 2024 Plans:</b> In FY 2024 technical work from this effort has been realigned to Program Advanced Aerospace Sensors, 0603203F; Project Advanced Aerospace Sensors Technology, 63665A; Multi-Spectrum Sensing Demonstration effort.</p> <p><b>FY 2025 Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable</p>	9.438	0.000	0.000
<p><b>Title:</b> Triple Raven Advanced Technology Demonstration</p> <p><b>Description:</b> Advance, demonstrate, and transition innovative imaging and non-imaging optical sensing technologies for surveillance and reconnaissance of airborne and ground-based objects of interest in an anti-access/area denial environment. This effort includes the development of systems, subsystems, and components necessary to yield new capabilities.</p> <p><b>FY 2024 Plans:</b></p>	5.670	0.000	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>	<b>Project (Number/Name)</b> 63665A / <i>Advanced Aerospace Sensors Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>In FY 2024 technical work from this effort has been realigned to Program Advanced Aerospace Sensors, 0603203F; Project Advanced Aerospace Sensors Technology, 63665A; Multi-Spectrum Sensing Demonstration effort.</p> <p><b>FY 2025 Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable</p>				
<p><b>Title:</b> Multi-Spectrum Sensing Demonstration</p> <p><b>Description:</b> Develop and demonstrate new techniques for finding and identifying critical mobile targets (both land and maritime) in a highly contested environment. Bring together multi-domain electro-optical/infrared and radio frequency technologies suitable for the contested environment, in conjunction with advanced processing and algorithms to provide for decision-making at the edge. Multiple sensing modalities may be deployed on the same platform or on separate platforms to improve survivability and flexibility. A focus is on providing actionable information to a user making a decision for future actions, such as strike. The effort will conduct a robust demonstration showing how the techniques enable combat operations, emphasizing resilience and tactically-relevant persistence.</p> <p><b>FY 2024 Plans:</b> Initiate investigation of employment concepts for penetrating intelligence, surveillance and reconnaissance, and strike to bound platforms along with their costs and available payloads. Initiate definition of options for electro-optical/infrared sensors drawing on prior work on low cost, size, weight, and power sensors and algorithms. Initiate work on an attritable laser radar sensor based on prior multi-mode laser radar work. Initiate definition of options for radio frequency sensors and techniques drawing on prior work on low-cost multi-function radio frequency sensors and distributed radio frequency techniques. Initiate planning for experiments to refine distributed radio frequency techniques. Initiate investigation into paths to bring legacy sensors into compliance with Department of Defense and Department of the Air Force open interface standards. Initiate stand up a hardware/software integration lab to verify open standard compliance. Continue to leverage prior work on sensor fusion to initiate a focused effort on fusion in support of command and control to engage surface (ground and maritime) targets.</p> <p><b>FY 2025 Plans:</b> - Continue to refine employment concepts for penetrating intelligence, surveillance and reconnaissance, and strike to bound platforms along with their costs and available payloads. - Continue development of electro-optical/infrared sensors and algorithms balancing performance with cost, size, weight, and power. - Continue development and packaging of an attritable laser radar sensor based on prior multi-mode laser radar work. - Continue development of radio frequency sensors and techniques.</p>		0.000	14.373	10.995

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>	<b>Project (Number/Name)</b> 63665A / <i>Advanced Aerospace Sensors Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue to refine experiments that will demonstrate multi-phenomenology sensor capability.</li> <li>- Continue to refine distributed radio frequency techniques.</li> <li>- Continue sensor upgrades that bring them into compliance with Department of Defense and Department of Air Force open interface standards.</li> <li>- Continue open standard compliance verification effort through use of hardware/software integration labs.</li> <li>- Continue to leverage prior work on sensor fusion to initiate a focused effort on fusion in support of command and control to engage surface (ground and maritime) targets.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$3.378 million due to re-prioritization to meet the nation's future security needs.</p>				
<p><b>Title:</b> Surface Targets Sense-Making</p> <p><b>Description:</b> Provides real-time multi-domain battlespace awareness in highly contested environments. Develops and demonstrates autonomous cross-domain, cross-platform integrated software and hardware capabilities that enables Intelligence, Surveillance, and Reconnaissance, against high value maritime targets, in unmanned airborne systems at the tactical edge in communications degraded and denied environments. Fusion of information from multiple sources with on-board and local sensors to provide higher fidelity battlespace awareness information to the joint force as part of the Sensing Grid feed to the Joint All Domain Command and Control capability. Leverages Open Mission Systems and Sensor Open Systems Architectures to maximize platform compatibility.</p> <p><b>FY 2024 Plans:</b> Initiate assessment and selection of surface sensing and sense-making capabilities to provide multi-modal surface target classification. Initiate assessment and selection of sensing autonomy capabilities that will enable multi-modal and distributed sensor resource management that will optimize the tracking and identification of high value surface targets. Initiate the expansion of existing Modeling, Simulation, and Analysis products to represent the maritime scenario of interest and enable the necessary assessment of system design trades and associated Model Based System Engineering activities. Initiate algorithm development of mission autonomy solutions that would enable the orchestration of unmanned airborne systems for ISR support to maintain custody of high value maritime targets. Initiate the algorithm development of advanced analytics to forecast the behavior of priority surface targets. Initiate software and hardware integration of contributing algorithms into the Systems Integration Laboratory/Hardware Integration Laboratory. Initiate investigation into the optimization of existing interfaces with off-board systems connected to Joint All Domain Command and Control enterprise to enable the sharing of relevant Multi-Intelligence/Multi-Domain data sources. Initiate advanced hardware purchases for multi-platform Live, Virtual, and Constructive testing and operational experimentation. Initiate transition analysis, planning and documentation of the overall system to a transition partner.</p> <p><b>FY 2025 Plans:</b></p>		0.000	15.000	10.851

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>	<b>Project (Number/Name)</b> 63665A / <i>Advanced Aerospace Sensors Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue assessment and selection of surface sensing and sense-making capabilities of multi-modal surface target classification as appropriate, based on knowledge gained in the previous year.</li> <li>- Continue selection of sensing autonomy capabilities enabling multi-modal and distributed sensor resource management for optimized tracking and identification of high value surface targets.</li> <li>- Continue expansion of Modeling, Simulation, and Analysis products to represent the maritime scenario of current interest enabling the necessary assessment of system design trades.</li> <li>- Continue to capture knowledge and design information using Model Based System Engineering.</li> <li>- Continue algorithm development of mission autonomy solutions as appropriate enabling the orchestration of unmanned airborne systems for ISR support to maintain custody of critical maritime targets.</li> <li>- Continue development of advanced analytics to forecast the behavior of surface targets.</li> <li>- Continue software and hardware integration and test in the Systems Integration Laboratory/Hardware Integration Laboratory.</li> <li>- Continue investigation into existing interfaces with off-board systems connected to Joint All Domain Command and Control enterprise by focusing attention on the sharing of relevant Multi-Intelligence/Multi-Domain data sources in both directions.</li> <li>- Continue development of multi-platform Live, Virtual, and Constructive testing and operational experimentation.</li> <li>- Continue transition analysis, planning and documentation of the overall system to a relevant partner.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$4.149 million due to re-prioritization to meet the nation's future security needs.</p>			
<p><b>Title:</b> Integrated Sensing Demonstration</p> <p><b>Description:</b> Integrate emerging technologies to demonstrate enhanced forward air-layer air base defense capabilities. Goal is to improve surveillance, shorten reaction time, and to apply a range of effects at precise points to provide early warning and enable defensive measures. FY 2025 funding for the technical work for this effort was realigned from Program Advanced Aerospace Sensors, 0603203F; Project Target Attack and Recognition Technology, 6369DF; Integrated Sensing Demonstration effort.</p> <p><b>FY 2024 Plans:</b> In FY 2024, this effort was aligned to Program 0603203F, Advanced Aerospace Sensors, Project 6369DF, Target Attack and Recognition Technology, Integrated Sensing Demonstration effort.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue integration of chosen technologies onto demonstration platform.</li> <li>- Initiate experiments to characterize integrated technologies.</li> <li>- Continue use of mission level modeling and model-based systems engineering to provide quantifiable data to drive towards solution sets that provide leading capabilities.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	0.000	0.000	9.422

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>	<b>Project (Number/Name)</b> 63665A / <i>Advanced Aerospace Sensors Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 increased compared to FY 2024 by \$9.422 million. Funding increased as a result of the transfer of funding and technical effort from Program 0603203F, Advanced Aerospace Sensors, Project 6369DF, Target Attack and Recognition Technology, Integrated Sensing Demonstration effort to this effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	15.108	29.373	31.268

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>				<b>Project (Number/Name)</b> 6369DF / <i>Target Attack and Recognition Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
6369DF: <i>Target Attack and Recognition Technology</i>	-	20.246	18.673	6.667	0.000	6.667	6.834	6.846	7.096	7.244	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project area develops and demonstrates advanced technologies for closed-loop, multi-domain, multi-intelligence sources, multi-platform, multi-sensor automation and autonomy, providing capabilities in battle management, fire control, battlespace awareness and visualization, predictive analytics, target recognition, sensor and information fusion, and sensor / platform asset tasking. This project also conducts advanced investigations to determine solution credibility, in terms of underlying technology and in terms of consistency with future Air Force missions within highly contested environments. This project includes robust techniques to support intelligence, surveillance, and reconnaissance and targeting missions within adverse weather conditions and against adversaries employing deceptive techniques. This project includes development of software-intensive solutions suitable for cloud-based integration and for development/operations-like operational environments. This project develops technology for effective management of online and offline information sources incorporating both constrained and cooperative sensing. This project has been realigned to better reflect technical areas being emphasized such as autonomy, multi-domain and multi-sensor information processing, leverage of machine learning developments and enterprise-level modeling, simulation and analysis.

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)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Multidomain Analytic Development - Evolution	13.006	0.000	0.000
<p><b>Description:</b> Develop enabling capabilities and technical know-how required for Department of the Air Force multi-domain command and control within highly contested environments through closed-loop central and decentralized sensing for battle management, automated onboard systems that use complex reasoning for situational awareness (SA) leading "intelligent" response, executive reasoning for selectable re-planners that provide task allocation. Use of shared models with both onboard reasoners and mission simulation and evaluation. Built with government-owned scalable closed-loop algorithms.</p> <p><b>FY 2024 Plans:</b> FY 2024 funding the technical work from this effort has been realigned to Program Advanced Aerospace Sensors, 0603203F; Project Target Attack and Recognition Technology, 6369DF; Integrated Sensing Demonstration and Autonomous Capability for Air Defense efforts.</p> <p><b>FY 2025 Plans:</b></p>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>	<b>Project (Number/Name)</b> 6369DF / <i>Target Attack and Recognition Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
Not Applicable				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable				
<b>Title:</b> Resilient & Agile Mission Systems Architecture		1.723	0.000	0.000
<b>Description:</b> This project performs advanced development and demonstration of methods, technologies, and tools to enable resilience and protect mission systems against threats. This involves open and adaptable architectures for rapid integration and agile systems, cyber protections and resilience technologies to protect against threats. It integrates research efforts in electronic and cyber warfare to demonstrate novel operational capabilities through laboratory, field, and flight tests and experimentation. The goal is to reduce risk for rapid transition of novel operational capabilities into Air Force mission systems.				
<b>FY 2024 Plans:</b> FY 2024 funding and the technical work from this effort has been realigned to Program Advanced Aerospace Sensors, 0603203F; Project Target Attack and Recognition Technology, 6369DF; Integrated Sensing Demonstration and Autonomous Capability for Air Defense efforts.				
<b>FY 2025 Plans:</b> Not Applicable				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable				
<b>Title:</b> Integrated Sensing Demonstration		0.000	12.249	0.000
<b>Description:</b> Integrate emerging technologies to demonstrate enhanced forward air-layer air base defense capabilities. Goal is to improve surveillance, shorten reaction time, and to apply a range of effects at precise points to provide early warning and enable defensive measures.				
<b>FY 2024 Plans:</b> Initiate development and integration of demonstrated Air Force Research Laboratory technologies, emerging commercial capabilities and program of record systems into a forward air-layer air base defense mission-focused capability. Employ mission level modeling and model-based systems engineering to provide quantifiable data to drive towards solution sets that provide leading capabilities.				
<b>FY 2025 Plans:</b>				

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>	<b>Project (Number/Name)</b> 6369DF / <i>Target Attack and Recognition Technology</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>In FY 2025, this effort was realigned to Program 0603203F, Advanced Aerospace Sensors, Project 63665A, Advanced Aerospace Sensors Technology, Integrated Sensing Demonstration effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$12.249 million. Funding decreased due to realignment of this effort to Program 0603203F, Advanced Aerospace Sensors, Project 63665A, Advanced Aerospace Sensors Technology, Integrated Sensing Demonstration effort.</p>				
<p><b>Title:</b> Autonomous Capability for Air Defense</p> <p><b>Description:</b> Design, develop and demonstrate an artificial intelligence tactical autopilot engaging in multi-ship/multi-role beyond visual range and intelligence, surveillance and reconnaissance combat operations with proficiency at or greater than Weapons School graduates. Design, develop and demonstrate an artificial intelligence-driven multi-platform/multi-domain sense-making, predictive analytics, and orchestration at the tactical edge to track/identify air and ground targets; Autonomous Air Combat Operations.</p> <p><b>FY 2024 Plans:</b> Initiate integration and demonstration of edge sensing assets cued via centralized intelligence data on air threats. Initiate evaluation of on board fusion and predictive analytics to inform orchestration of attritable platforms into areas of interest. Initiate testing and evaluation of multi-platform resource managers to position assets for optimal sensing geometries. Initiate development of advanced autonomy algorithms using modern machine learning tools that control the aircraft, sensors, and weapons onboard manned and/or unmanned aircraft and perform operationally relevant combat tactics.</p> <p><b>FY 2025 Plans:</b> - Continue demonstration of edge sensing assets cued via centralized intelligence data on air threats to support evaluation of performance via life flight tests. - Continue both evaluation and advancement of solution options for on board fusion and predictive analytics to inform orchestration of attritable platforms into areas of interest. - Continue testing and evaluation of multi-platform resource managers to position assets for optimal sensing geometries. - Continue development of advanced autonomy algorithms using modern machine learning tools that control the aircraft, sensors, and weapons onboard manned and/or unmanned aircraft and perform operationally relevant combat tactics.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$0.243 million. Justification for this increase is described in plans above.</p>		0.000	6.424	6.667
<b>Accomplishments/Planned Programs Subtotals</b>		14.729	18.673	6.667



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603203F / <i>Advanced Aerospace Sensors</i>	<b>Project (Number/Name)</b> 6369DF / <i>Target Attack and Recognition Technology</i>
--	---	--

	FY 2023	FY 2024
<b>Congressional Add:</b> Modular open autonomous software testing	5.517	-
<b>FY 2023 Accomplishments:</b> Conduct Congressional directed efforts		
<b>Congressional Adds Subtotals</b>	5.517	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force / BA 3: Advanced Technology Development (ATD)	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / Aerospace Technology Dev/Demo
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	95.428	51.896	102.529	0.000	102.529	113.400	138.405	164.674	168.118	Continuing	Continuing
634093: <i>Missile Rocket Propulsion Integ &amp; Demo</i>	-	0.000	0.000	6.079	0.000	6.079	5.692	5.809	6.018	6.144	Continuing	Continuing
634094: <i>Next Gen Platform Dev/ Demo</i>	-	13.914	6.591	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
634920: <i>Flight Vehicle Tech Integration</i>	-	24.920	13.008	38.172	0.000	38.172	24.316	24.569	46.688	47.653	Continuing	Continuing
634921: <i>Aircraft Propulsion Subsystems Int</i>	-	0.000	0.000	23.645	0.000	23.645	20.060	14.441	15.054	15.368	Continuing	Continuing
634926: <i>High Speed Systems Integ &amp; Demo</i>	-	40.501	13.611	23.715	0.000	23.715	46.322	76.258	79.020	80.673	Continuing	Continuing
634927: <i>Flight Systems Control</i>	-	16.093	18.686	10.918	0.000	10.918	17.010	17.328	17.894	18.280	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program supports Department of Defense (DoD) priorities for Aerospace Systems demonstrations to include high-speed systems and autonomous collaborative platforms. System level integration and demonstration of advanced aerospace system technologies (autonomy, propulsion, power and thermal, air vehicle, fuels, etc.) in a near-realistic operational environment enhance performance and supportability of existing and future aerospace systems while reducing the risk and time required to transition technologies into operational aircraft. Additionally, this program supports the nuclear enterprise and nuclear deterrence through advanced component and technology demonstrations. Projects in this program have been coordinated through the DoD Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

The program has six current projects, each focusing on technologies with a high potential to enhance the performance of existing and future Air Force weapon systems per modeling, simulation, and analysis while utilizing digital engineering to accelerate and enhance the science and technology development.

- Missile Rocket Propulsion Integration and Demonstration: Develops and demonstrates innovative rocket propulsion technologies, propellants, and manufacturing techniques for strategic and tactical systems to reduce costs, schedule, and increase performance.

- Next Gen Platform Dev/Demo: Supports the nuclear enterprise and nuclear deterrence through advanced component and technology demonstrations.

- Flight Vehicle Tech Integration: Develops and demonstrates aerospace vehicle technology to enhance the capability of current and future aerospace systems with current focus on autonomous collaborative platform capabilities.

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / <i>Aerospace Technology Dev/Demo</i>
--	--

- Aircraft Propulsion Subsystems Integration: Develops and demonstrates propulsion technology to increase warfighting capability by advancing engine operational reliability and durability, providing mission flexibility, and improved performance while reducing weight, fuel consumption, and cost of ownership.
- High Speed Systems Integration and Demonstration: Develops, demonstrates, and integrates high speed propulsion capability (to include hypersonic) to enhance and enable high speed system technology, increasing long range strike capabilities at the speed of critical warfighting capabilities required for near peer competition.
- Flight Systems Control: Develops and demonstrates adaptive power and thermal management components, controls and systems for high-power payloads enabling aerospace systems to deliver strike capabilities while integrating autonomy and control technologies to enable affordable mass in the fight and revolutionary autonomous collaborative platform capabilities.
- Advanced Aerospace Propulsion: Develops and demonstrates high speed propulsion capability (to include hypersonic) to enhance and enable long range strike capabilities at the speed of relevance for the Department of the Air Force.

In FY 2025, the RDT&E Budget Activity 03 (BA03) Aerospace Propulsion and Power Technology efforts and activities under PE 0603216F, are transferred to PE 0603211F, Aerospace Technology Dev/Demo for increased integration between airframe, flight control, propulsion, electrical, power and thermal management.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 633035 Aerospace Power Technology, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634927 Flight Systems Control.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634093 Missile Rocket Propulsion Integ & Demo, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634093 Missile Rocket Propulsion Integ & Demo.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 635098 Advanced Aerospace Propulsion, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634926 High Speed Systems Integ & Demo.

Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

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 program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 0602298F, and 1206601SF.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / <i>Aerospace Technology Dev/Demo</i>
--	--

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	95.267	51.896	77.684	0.000	77.684
Current President's Budget	95.428	51.896	102.529	0.000	102.529
Total Adjustments	0.161	0.000	24.845	0.000	24.845
• 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	-0.151	0.000			
• SBIR/STTR Transfer	-3.489	0.000			
• Other Adjustments	3.801	0.000	24.845	0.000	24.845

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project: 634920: *Flight Vehicle Tech Integration***

Congressional Add: *Unmanned adversary air platform*

Congressional Add: *Bonded unitized composites large scale structural demonstration*

Congressional Add: *Program increase - digital design studio*

Congressional Add: *Airborne missile defense beam Director development and Flight Environment Qualification*

Congressional Add Subtotals for Project: 634920

**Project: 634926: *High Speed Systems Integ & Demo***

Congressional Add: *Hypersonic aircraft rapid prototyping*

Congressional Add Subtotals for Project: 634926

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	9.404	-
	9.234	-
	1.926	-
	0.963	-
	21.527	-
	28.902	-
	28.902	-
	50.429	-

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force Date: March 2024

Appropriation/Budget Activity	R-1 Program Element (Number/Name)
3600: <i>Research, Development, Test &amp; Evaluation, Air Force / BA 3: Advanced Technology Development (ATD)</i>	PE 0603211F / <i>Aerospace Technology Dev/Demo</i>

**Change Summary Explanation**

FY 2025 funding increased compared to FY 2024 by \$50.633 million. The increase is due to the transfer of PE 63216F, Aerospace Propulsion & Power, efforts to PE 0603211F, Aerospace Technology Dev/Demo.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603211F / Aerospace Technology Dev /Demo				<b>Project (Number/Name)</b> 634093 / Missile Rocket Propulsion Integ & Demo			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
634093: <i>Missile Rocket Propulsion Integ &amp; Demo</i>	-	0.000	0.000	6.079	0.000	6.079	5.692	5.809	6.018	6.144	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates technologies for strategic systems (including solid rocket motor boosters, post boost control, and aging and surveillance efforts) and tactical rockets. Characteristics such as environmental acceptability, affordability, manufacturability, reliability, responsiveness, reduced weight, and reduced operation and launch costs are emphasized. Rapid design, characterization, demonstration, and rapid manufacturing are key goals while ensuring increased life and performance. Technology areas investigated include ground demonstrations of compact, lightweight, advanced propulsion technologies and high-energy propellants. This project demonstrates next generation of physics-based modeling, simulation, and analysis (MS&A) tools for rapid and agile missile propulsion design, analysis, and production, as well as the digital engineering concepts to manage the entire process of design, test, and validation of solid rocket motors. The efforts in this project contribute to the sustainment of the rocket propulsion industry, providing rocket propulsion technology for the Department of Defense (DoD). The efforts in this project are reviewed by a DoD level steering committee annually for relevance to DoD missions.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634093 Missile Rocket Propulsion Integ & Demo, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634093 Missile Rocket Propulsion Integ & Demo.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Missile Propulsion Technologies	0.000	0.000	6.079
<b>Description:</b> Develop and demonstrate missile propulsion technologies for ballistic missiles and tactical missiles. Research integrates digital design and test with novel manufacturing processes to support national defense needs for performance, effectiveness, and industrial manufacturing capability for missile propulsion.			
<b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0603216F, Aerospace Propulsion and Power Technology, Project 634093 Missile Rocket Propulsion Integ & Demo, Ballistic Missile Technologies effort.			
<b>FY 2025 Plans:</b> - Continue development and test of solid rocket motors relevant to defense needs such as large air-launched boosters for high speed weapon application.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / <i>Aerospace Technology Dev /Demo</i>	<b>Project (Number/Name)</b> 634093 / <i>Missile Rocket Propulsion Integ &amp; Demo</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Continue to design and develop modeling and simulation tools that more fully describe the physical processes that occur during manufacture and/or operation, and that reduce predictive uncertainty in design and analysis.</p> <p>- Continue development of advanced manufacturing processes for solid rocket motors including inert components, energetic components, fabrication systems and automated assembly operations.</p> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 increased compared to FY 2024 by \$6.079 million. \$0.034 million of the increase is due to increased emphasis in missile propulsion technologies. \$6.045 million is due to transfer of Missile Propulsion Technologies effort from PE 0603216F, Aerospace Propulsion and Power Technology, Project 634093 Missile Rocket Propulsion Integ &amp; Demo, effort Ballistic Missile Propulsion Technologies.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.000	6.079

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603211F / Aerospace Technology Dev /Demo				<b>Project (Number/Name)</b> 634094 / Next Gen Platform Dev/Demo			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
634094: Next Gen Platform Dev/Demo	-	13.914	6.591	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project demonstrates advanced nuclear-related components and technologies in support of the nuclear enterprise and nuclear deterrence operations missions. Next Gen Platform Development/Demonstration efforts are accomplished through development, integration, testing, and evaluation of various technologies to include fuzes, aeroshells, inertial guidance, and nuclear-specific communications for demonstration in near-realistic operational environments.

This Project and associated efforts will continue to be executed by the Air Force Research Laboratory Space Vehicles Technology Directorate located in Kirtland Air Force Base, New Mexico.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Advanced Nuclear Components	13.914	6.591	0.000
<b>Description:</b> Develop next-generation solid state, radiation-hardened strategic advance inertial system components for hostile environment.			
<b>FY 2024 Plans:</b> Continue iterative development of inertial sensor systems, including gyroscope and accelerometer technologies for a nested sensor configuration insertion into an Inertial Measurement Unit (IMU), in coordination with PE 0603273 guidance technology development. Continue development of radiation hardened electronics/components supporting the nested sensor design. Continue laboratory and environmental testing of IMU components. Complete concept design and testing of radiation hardened solid-state gyroscope technology. Continue covariance analysis improvement through sensor/system test data inputs to predict IMU performance.			
<b>FY 2025 Plans:</b> In FY2025 funding and effort within this thrust was realigned to Budget Activity 03, Program 0603273F Science & Technology for Nuclear Re-entry Systems, Project 634094 Next Gen Platform Dev/ Demo. This was accomplished to better align complimentary Nuclear S&T Advanced Technology Development efforts to provide more traceability between these tightly coupled efforts.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$6.591 million due to realignment of funds into PE 0603273F Project 634094.			
<b>Accomplishments/Planned Programs Subtotals</b>	13.914	6.591	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force			<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3		<b>R-1 Program Element (Number/Name)</b> PE 0603211F / <i>Aerospace Technology Dev /Demo</i>		<b>Project (Number/Name)</b> 634094 / <i>Next Gen Platform Dev/Demo</i>	

**C. Other Program Funding Summary (\$ in Millions)**

<u>Line Item</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u> <u>Base</u>	<u>FY 2025</u> <u>OCO</u>	<u>FY 2025</u> <u>Total</u>	<u>FY 2026</u>	<u>FY 2027</u>	<u>FY 2028</u>	<u>FY 2029</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• RDTE 03 0603273F: <i>Science &amp; Technology for Nuclear Re-entry Systems</i>	39.431	70.162	87.945	-	87.945	118.933	155.791	161.244	-	Continuing	Continuing

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603211F / Aerospace Technology Dev /Demo				<b>Project (Number/Name)</b> 634920 / Flight Vehicle Tech Integration			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
634920: <i>Flight Vehicle Tech Integration</i>	-	24.920	13.008	38.172	0.000	38.172	24.316	24.569	46.688	47.653	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project demonstrates advanced aerospace vehicle technologies. Aerospace Vehicle Technology Integration efforts are accomplished through integration of various technologies to include avionics, advanced propulsion, and weapon systems for demonstration in near-realistic operational environments. Advanced aerospace structures technologies are demonstrated to enhance the capability of current and future aerospace vehicles.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Aerospace Vehicle Technology Integration	3.393	13.008	38.172
<b>Description:</b> Develop, simulate, and demonstrate integrated technologies to improve the performance of aerospace platform capabilities.			
<b>FY 2024 Plans:</b> Complete the fabrication and continue flight test of a sensor variant of a low cost unmanned aerospace system. Continue the development of technology demonstrations for a forward weapons employment derivative of a low cost unmanned aerospace system. Initiate build of the affordable weapons platform for future flight experimentation.			
<b>FY 2025 Plans:</b> - Initiate research for aircraft drag reduction efforts. - Initiate ground testing of the affordable unmanned weapons platform. - initiate integrated demonstrations of the sensor variant of the low-cost unmanned system. - Continue technology demonstration of a forward, weapons-capable low-cost unmanned aerospace system. - Complete the build of the affordable unmanned sensor platform. - Complete basic flight testing.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$25.164 million. Funding increased due to OUSD directed effort in drag reduction for aerospace systems and the acceleration of technology development of autonomous collaborative platform capability for low-cost unmanned aerospace systems, including forward sensing and weapons integration.			
<b>Accomplishments/Planned Programs Subtotals</b>	3.393	13.008	38.172

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / Aerospace Technology Dev /Demo	<b>Project (Number/Name)</b> 634920 / Flight Vehicle Tech Integration

	FY 2023	FY 2024
<b>Congressional Add:</b> Unmanned adversary air platform <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts. This effort will be executed in Program 0603211F, Aerospace Technology Dev/Demo, Project 634920, Flight Vehicle Tech Integration.	9.404	-
<b>Congressional Add:</b> Bonded unitized composites large scale structural demonstration <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts. This effort will be executed in Program 0603211F, Aerospace Technology Dev/Demo, Project 634920, Flight Vehicle Tech Integration.	9.234	-
<b>Congressional Add:</b> Program increase - digital design studio <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts.	1.926	-
<b>Congressional Add:</b> Airborne missile defense beam Director development and Flight Environment Qualification <i>FY 2023 Accomplishments:</i> Conduct Congressionally directed efforts. This effort will be executed in Program 0603211F, Aerospace Technology Dev/Demo, Project 634920, Flight Vehicle Tech Integration.	0.963	-
<b>Congressional Adds Subtotals</b>	21.527	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603211F / Aerospace Technology Dev /Demo				<b>Project (Number/Name)</b> 634921 / Aircraft Propulsion Subsystems Int			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
634921: Aircraft Propulsion Subsystems Int	-	0.000	0.000	23.645	0.000	23.645	20.060	14.441	15.054	15.368	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates technology to increase military utility via turbine engine operational reliability, durability, mission flexibility, and performance while reducing weight, fuel consumption, and cost of ownership. The Aircraft Propulsion Subsystems Integration (APSI) project includes demonstrator engines that address military specific needs for manned systems, autonomous vehicles and munitions applications. This project also focuses on integration of inlets, nozzles, engine-to-airframe compatibility, and power and thermal management subsystems technologies.

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.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Expendable/Autonomous Vehicle Engine Capability	0.000	0.000	14.671
<b>Description:</b> Design, fabricate, and test component technologies for non-man rated engine applications to improve the performance, durability, and affordability of autonomous vehicles and munitions.			
<b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, Missile/Remotely Piloted Aircraft Engine Performance effort.			
<b>FY 2025 Plans:</b>			
<ul style="list-style-type: none"> <li>- Complete operational benefits analysis for missile and unmanned aerial vehicle (UAV) systems.</li> <li>- Complete development of pervasive, hydrocarbon pressure gained propulsion fueled technologies.</li> <li>- Complete advanced development in rotating detonation engine technologies to advance powered munitions.</li> <li>- Continue new engine technologies to deliver reduced takeoff length, increased range, loiter, combat maneuverability, and lower cost for affordable UAS in contested environments; advancing novel augmentor technology design.</li> </ul>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / <i>Aerospace Technology Dev /Demo</i>	<b>Project (Number/Name)</b> 634921 / <i>Aircraft Propulsion Subsystems Int</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>- Initiate military utility studies for autonomous vehicles powered by air breathing propulsion.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$14.671 million. \$0.710 million of the increase is due to increased emphasis in autonomous vehicle engine capability. \$13.961 million is due to transfer of Expendable/Autonomous Vehicle Engine Capability effort from PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, Missile/Remotely Piloted Aircraft Engine Performance effort.</p>				
<p><b>Title:</b> Core Engine Technologies</p> <p><b>Description:</b> Design, fabricate, and demonstrate performance predictions in core engines, using innovative engine cycles and advanced materials for turbine engines.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, Core Engine Technologies effort.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete core tests for medium scale engines maturing key technologies.</li> <li>- Complete risk reduction component tests for medium- scale engine advanced fan and core.</li> <li>- Continue advanced propulsion air frame integration experiments to enable embedded propulsion systems; validating methodologies to enable embedded turbine engine propulsion.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$8.861 million. \$6.889 million of the increase is due to increased emphasis in core engine technologies for advancing embedded engine turbofan designs. \$1.972 million is due to transfer of Core Engine Technologies effort from PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, Core Engine Technologies effort.</p>		0.000	0.000	8.861
<p><b>Title:</b> High Pressure Ratio Core Engine Technologies</p> <p><b>Description:</b> Design, fabricate, and demonstrate high overall pressure ratio engine cores to provide increased durability and affordability with lower fuel consumption for turbofan and for turboshaft engines.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, High Pressure Ratio Core Engine Technologies effort.</p> <p><b>FY 2025 Plans:</b></p>		0.000	0.000	0.113

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / <i>Aerospace Technology Dev /Demo</i>	<b>Project (Number/Name)</b> 634921 / <i>Aircraft Propulsion Subsystems Int</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
- Complete work and maturation of medium scale core technologies.			
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 increased compared to FY 2024 by \$0.113 million. Funding increased due to transfer of High Pressure Ratio Core Engine Technologies effort from PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, High Pressure Ratio Core Engine Technologies effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.000	23.645

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603211F / Aerospace Technology Dev /Demo				<b>Project (Number/Name)</b> 634926 / High Speed Systems Integ & Demo			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
634926: High Speed Systems Integ & Demo	-	40.501	13.611	23.715	0.000	23.715	46.322	76.258	79.020	80.673	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates, via modeling, simulations and analysis (MS&A), and ground and flight tests, advanced technologies that enable future high speed/hypersonic weapons and platforms (vehicles). System level integration brings together air vehicle technologies (including high speed structural solutions) with avionics, propulsion, warheads and other aerospace subsystems for demonstration in a near-realistic operational environment. Integration and technology demonstrations reduce the risk and time required to transition technologies into operational systems. Digital engineering is utilized to develop and deliver an integrated digital environment (IDE) to assess technology, evaluate its impacts, and make capability-focused investment decisions. One key technology is a scramjet/dual-mode ramjet propulsion system. The development, integration, and demonstration of this propulsion system to a readiness level appropriate for full integration with other engine cycles (including turbine and rocket-based) is critical to provide the Air Force with revolutionary military capabilities. Multi-cycle engines will provide the propulsion systems for possible application to support aircraft and weapon platforms. Efforts include: scramjet flow-path (from inlet to nozzle) optimization to enable operation over the widest possible range of Mach numbers; active combustion control to assure continuous positive thrust (even during mode transition); robust flame-holding to maintain stability through flow distortions; maximized volume-to-surface area to minimize the thermal load imposed by the high-speed engine; thermal management systems (for example fuels, structural considerations, and power) play a vital role in scramjet and combined cycle engines, including considerations for protecting low speed propulsion systems (e.g., turbine engines) during hypersonic flight.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 635098 Advanced Aerospace Propulsion, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634926 High Speed Systems Integ & Demo.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> High Speed/Hypersonic Vehicle Technologies	11.599	13.611	11.606
<b>Description:</b> Develop, simulate, and demonstrate integrated vehicle technologies to enable and improve the performance of future high-speed and hypersonic systems.			
<b>FY 2024 Plans:</b> Continue Multi-Mission Cruiser technology maturation activities to expand performance capabilities of high speed systems. Continue robust digital engineering framework, model-based systems engineering, and multi-level modeling, simulation & analysis (MS&A) for accelerated, focused technology development and demonstration. Initiating design work for expendable hypersonic multi-mission ISR and Strike demo.			
<b>FY 2025 Plans:</b>			



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / <i>Aerospace Technology Dev /Demo</i>	<b>Project (Number/Name)</b> 634926 / <i>High Speed Systems Integ &amp; Demo</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue Multi-Mission Cruiser technology maturation activities to expand performance capabilities of high speed systems .</li> <li>- Continue robust digital engineering framework, model-based systems engineering, and multi-level modeling, simulation &amp; analysis (MS&amp;A) for accelerated, focused technology development and demonstration.</li> <li>- Continue design work for expendable hypersonic multi-mission Intelligence, Surveillance and Reconnaissance (ISR) and Strike demo.</li> <li>- Initiate technology maturation activities to investigate performance capabilities of reusable hypersonic vehicles.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$2.005 million due to re-prioritization to meet the nation's future security needs.</p>				
<p><b>Title:</b> Scramjet Technologies</p> <p><b>Description:</b> This project develops and demonstrates, via ground and flight tests, the scramjet propulsion cycle to a technology readiness level appropriate for full integration with other engine cycles (including turbine and rocket-based) to provide the Air Force with transformational military capabilities.. Multi-cycle engines will provide the propulsion systems for possible application to support aircraft and weapon platforms. Efforts include: scramjet flow-path optimization to enable operation over the widest possible range of Mach numbers; active combustion control to assure continuous positive thrust (even during mode transition); robust flame-holding to maintain stability through flow distortions; and maximized volume-to-surface area to minimize the thermal load imposed by the high-speed engine. Thermal management plays a vital role in scramjet and combined cycle engines, including considerations for protecting low speed propulsion systems (e.g., turbine engines) during hypersonic flight.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0603216F, Aerospace Propulsion and Power Technology, Project 635098 Advanced Aerospace Propulsion, Scramjet Technologies effort.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue development and integration of larger scale scramjet component technologies to enhance operability including robust operation during maneuvers and extended operating time.</li> <li>- Continue development and demonstration of tactically-relevant, scramjet engine designs, technologies, and components including ground and flight demonstrations needed for potential follow-on acquisition program.</li> <li>- Continue propulsion technology maturation activities for multi-mission cruiser concept to expand performance capabilities of high speed systems.</li> <li>- Continue integration of scramjet components into expendable hypersonic multi-mission Intelligence, Surveillance and Reconnaissance (ISR) and Strike demo design.</li> </ul>		0.000	0.000	12.109

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / Aerospace Technology Dev /Demo	<b>Project (Number/Name)</b> 634926 / High Speed Systems Integ & Demo

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
- Initiate technology maturation activities to investigate, develop, and demonstrate propulsion capabilities for reusable hypersonic vehicles			
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 increased compared to FY 2024 by \$12.109 million due to transfer of Scramjet Technologies effort from PE0603216F, Aerospace Propulsion & Power Technology, 634920 Advanced Aerospace Propulsion, to PE 0603211F, Aerospace Technology Dev/Demo, 634926 High Speed Systems Integ & Demo, Scramjet Technologies effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	11.599	13.611	23.715

	<b>FY 2023</b>	<b>FY 2024</b>
<b><i>Congressional Add:</i></b> Hypersonic aircraft rapid prototyping	28.902	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressionally directed efforts. This effort will be executed in Program 0603211F, Aerospace Technology Dev/Demo, Project 634926, High Speed Systems Integ & Demo.		
<b>Congressional Adds Subtotals</b>	28.902	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / Aerospace Technology Dev /Demo	<b>Project (Number/Name)</b> 634927 / Flight Systems Control
--	--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
634927: <i>Flight Systems Control</i>	-	16.093	18.686	10.918	0.000	10.918	17.010	17.328	17.894	18.280	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This program integrates and demonstrates advanced control technologies that improve the performance, reliability, safety, and survivability of existing and future, manned and unmanned, aerospace systems. Enhanced capabilities are enabled by control, automation, and system level integration of subsystems and systems such as propulsion, airframes, avionics, power & thermal management, weapons, communications, and operator interfaces. Modeling and simulation, integration, and technology demonstrations in a near-operational environment reduce the risk and time required to transition technologies into existing and future aerospace systems.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 633035 Aerospace Power Technology, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634927 Flight Systems Control.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<p><b>Title:</b> Autonomous Systems Control</p> <p><b>Description:</b> Develop, simulate, and demonstrate advanced automation and control-enabled capabilities for manned or unmanned aerospace platforms. Develop, simulate, and demonstrate autonomous flight controls for safe flight and cooperative operations between manned and remotely piloted air platforms.</p> <p><b>FY 2024 Plans:</b> Continue research to incorporate autonomous and safe airspace interoperability for manned and remotely piloted aircraft systems, airborne control of teams of unmanned aircraft, and unmanned sense and avoid technologies for ground and air operations. Initiate development and autonomy spiral demonstrations of advanced autonomy to manage a heterogeneous team of attritable and expendable aircraft without human interaction in complex missions and challenging threat environments.</p> <p><b>FY 2025 Plans:</b> - Complete research to incorporate autonomous and safe airspace interoperability for manned and remotely piloted aircraft systems, airborne control of teams of unmanned aircraft, and unmanned sense and avoid technologies for ground and air operations. - Continue development and autonomy spiral demonstrations of advanced autonomy to manage a heterogeneous team of affordable and expendable aircraft without human interaction in complex missions and challenging threat environments to include definition and scoping of flight experiment to accelerate transition of fully autonomous team capabilities.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	16.093	18.686	0.797

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603211F / <i>Aerospace Technology Dev /Demo</i>	<b>Project (Number/Name)</b> 634927 / <i>Flight Systems Control</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 decreased compared to FY 2024 by \$17.889 million. Funding decreased due to completion of one flight experiment activity and build-up toward the next.				
<p><b>Title:</b> High Power Aircraft Subsystem Technologies</p> <p><b>Description:</b> Develop and demonstrate integrated architecture, controls and components for power generation, conditioning, and distribution; energy storage components; and thermal management and subsystem technologies for integration into high power aircraft.</p> <p><b>FY 2024 Plans:</b> For FY 2024 and prior years, this work is performed under PE 0603216F, Aerospace Propulsion and Power Technology, Project 633035 Aerospace Power Technology, High Power Aircraft Subsystem Technologies effort.</p> <p><b>FY 2025 Plans:</b> - Continue development and demonstration of integrated power, thermal, and propulsion technologies for medium-scale systems including an initial hybrid architecture design to enable future electrified autonomous collaborative platform concepts. - Complete architecture and technology assessment and digital integration.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$10.121 million. \$0.054 million of the increase is due to transition to medium-scale system development activities. \$10.067 million increase is due to transfer of High Power Aircraft Subsystem Technologies effort from PE 0603216F, Aerospace Propulsion and Power Technology, Project 633035 Aerospace Power Technology, High Power Aircraft Subsystem Technologies effort.</p>		0.000	0.000	10.121
<b>Accomplishments/Planned Programs Subtotals</b>		16.093	18.686	10.918
<b>C. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				
<b>D. Acquisition Strategy</b>				
Not applicable.				

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	<b>R-1 Program Element (Number/Name)</b> PE 0603216F I Aerospace Propulsion and Power Technology
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	91.041	56.789	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
633035: Aerospace Power Technology	-	21.233	10.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
634093: Missile Rocket Propulsion Integ & Demo	-	12.704	6.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
634921: Aircraft Propulsion Subsystems Int	-	40.312	17.411	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
635098: Advanced Aerospace Propulsion	-	16.792	23.266	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops and demonstrates technologies to achieve enabling and revolutionary advances in turbine, advanced-cycle, rocket, and space propulsion as well as electrical power, thermal management, and fuels. The program has five current projects, each focusing on technologies with a high potential to enhance the performance of existing and future Air Force weapon systems. The Aerospace Power Technology project develops and demonstrates adaptive power and thermal management components, controls, and systems for high-power payloads and aircraft as part of energy-optimized aircraft development. The Aircraft Propulsion Subsystems Integration project develops demonstrator engines by integrating the engine cores demonstrated in the Advanced Turbine Engine Gas Generator project with low-pressure components. The Advanced Aerospace Propulsion project develops the scramjet propulsion cycle to a technology readiness level appropriate for in-flight demonstration and for full integration with other engine cycles (including turbine and rocket based). The Advanced Turbine Engine Gas Generator project develops and demonstrates core turbine engine technologies for current and future aircraft propulsion systems. The Missile Rocket Propulsion project develops and demonstrates innovative rocket propulsion technologies, propellants, and manufacturing techniques.

In FY 2025, the RDT&E Budget Activity 03 (BA03) Aerospace Propulsion and Power Technology efforts and activities under PE 0603216F, are transferred to PE 0603211F, Aerospace Technology Dev/Demo for increased integration between airframe, flight control, propulsion, electrical, power and thermal management.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 633035 Aerospace Power Technology, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634927 Flight Systems Control.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634093 Missile Rocket Propulsion Integ & Demo, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634093 Missile Rocket Propulsion Integ & Demo.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>
--	--

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 635098 Advanced Aerospace Propulsion, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634926 High Speed Systems Integ & Demo.

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 program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 0602298F, and 1206601SF.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

Projects in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	94.540	56.789	72.309	0.000	72.309
Current President's Budget	91.041	56.789	0.000	0.000	0.000
Total Adjustments	-3.499	0.000	-72.309	0.000	-72.309
• 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	0.080	0.000			
• SBIR/STTR Transfer	-3.255	0.000			
• Other Adjustments	-0.324	0.000	-72.309	0.000	-72.309

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 633035: *Aerospace Power Technology*

Congressional Add: *Program increase - Silicon carbide research*

Congressional Add Subtotals for Project: 633035

	<b>FY 2023</b>	<b>FY 2024</b>
	9.409	-
	9.409	-

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>
--	--

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

	FY 2023	FY 2024
<b>Project: 634093: <i>Missile Rocket Propulsion Integ &amp; Demo</i></b>		
Congressional Add: <i>Program increase - Altitude chamber infrastructure upgrades</i>	4.817	-
Congressional Add: <i>Advanced hybrid engine rocket development</i>	4.817	-
Congressional Add Subtotals for Project: 634093	9.634	-
<b>Project: 634921: <i>Aircraft Propulsion Subsystems Int</i></b>		
Congressional Add: <i>Low spool generator capabilities</i>	4.634	-
Congressional Add: <i>Program increase - turbo air cool HTPEM hydrogen fuel cell development</i>	11.878	-
Congressional Add Subtotals for Project: 634921	16.512	-
Congressional Add Totals for all Projects	35.555	-

**Change Summary Explanation**

FY 2025 funding decreased compared to FY 2024 by \$72.309 million. \$50.633 million of the decrease is due to the transfer from PE 0632016F, Aerospace Propulsion and Power Technology, to PE 0632011F, Aerospace Technology Dev & Demo. \$21.676 million of the decrease is due to re-prioritization to meet the nation's future security needs.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>				<b>Project (Number/Name)</b> 633035 / <i>Aerospace Power Technology</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
633035: <i>Aerospace Power Technology</i>	-	21.233	10.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates system and subsystem integration to include adaptive architectures, controls, actuation, electrical power, thermal management, and distribution for aerospace applications. This project develops and demonstrates the components, controls and systems required to satisfy the operational needs of current and future aircraft and enables the use of future high-power payloads. This technology enhances reliability and survivability, and reduces vulnerability, weight, and life cycle costs of air platforms. The electrical power system components developed are projected to provide a two-fold to five-fold improvement in aircraft reliability and maintainability, and a reduction in power system weight. This project is integrated into energy optimized aircraft efforts and power and thermal programs.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 633035 Aerospace Power Technology, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634927 Flight Systems Control.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> High Power Aircraft Subsystem Technologies	11.824	10.067	0.000
<b>Description:</b> Develop and demonstrate integrated architecture, controls and components for power generation, conditioning, and distribution; energy storage components; and thermal management and subsystem technologies for integration into high power aircraft.			
<b>FY 2024 Plans:</b> Complete development and demonstration of integrated, adaptive megawatt- class tactical aircraft power and thermal capability. Complete development and demonstration of megawatt class architecture, controls and integration. Initiate development and demonstration of integrated power, thermal, and propulsion technologies for medium-scale systems. Initiate architecture and technology assessment and digital integration.			
<b>FY 2025 Plans:</b> - Starting in FY 2025, this work will be performed under PE 0603211F, Aerospace Technology Dev/Demo, Project 634927 Flight Systems Control, High Power Aircraft Subsystem Technologies effort.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>			



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>	<b>Project (Number/Name)</b> 633035 / <i>Aerospace Power Technology</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 decreased compared to FY 2024 by \$10.067 million. Funding decreased due to transfer of High Power Aircraft Subsystem Technologies effort to PE 0603211F, Aerospace Technology Dev/Demo, Project 634927 Flight Systems Control, High Power Aircraft Subsystem Technologies effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	11.824	10.067	0.000

	<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Program increase - Silicon carbide research	9.409	-
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology, Project 633035, Aerospace Power Technology.		
<b>Congressional Adds Subtotals</b>	9.409	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>				<b>Project (Number/Name)</b> 634093 / <i>Missile Rocket Propulsion Integ &amp; Demo</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
634093: <i>Missile Rocket Propulsion Integ &amp; Demo</i>	-	12.704	6.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops technologies for the sustainment of strategic systems (including solid rocket motor boosters and missile propulsion, post boost control, and aging and surveillance efforts) and tactical rockets. 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 and high-energy propellants. Aging and surveillance thrusts for solid rocket motors could reduce lifetime prediction uncertainties for individual motors by fifty percent, enabling motor replacement for cause. 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). The efforts in this project are reviewed by a DoD level steering committee annually for relevance to DoD missions.

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.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634093 Missile Rocket Propulsion Integ & Demo, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634093 Missile Rocket Propulsion Integ & Demo.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Ballistic Missile Technologies	3.070	6.045	0.000
<b>Description:</b> Develop and demonstrate missile propulsion and post-boost control systems technologies for ballistic missiles.			
<b>FY 2024 Plans:</b> Continue development and test of solid rocket motors relevant to defense needs such as large air-launched boosters for high speed weapon application. Continue to design and develop modeling and simulation tools that more fully describe the physical processes that occur during manufacture and/or operation, and that reduce predictive uncertainty in design and analysis. Continue development of advanced manufacturing processes for solid rocket motors including inert components, energetic components, fabrication systems and automated assembly operations.			
<b>FY 2025 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
---	-------------------------

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>	<b>Project (Number/Name)</b> 634093 / <i>Missile Rocket Propulsion Integ &amp; Demo</i>
--	--	--

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
- Starting in FY 2025, this work will be performed under PE 0603211F, Aerospace Technology Dev/Demo, Project 634093 Missile Rocket Propulsion Integ & Demo, Missile Propulsion Technologies effort.			
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$6.045 million. Funding decreased due to transfer of Ballistic Missile Technologies effort to PE 0603211F, Aerospace Technology Dev/Demo, Project 634093 Missile Rocket Propulsion Integ & Demo, Missile Propulsion Technologies effort.			
<b>Accomplishments/Planned Programs Subtotals</b>	3.070	6.045	0.000

	FY 2023	FY 2024
<b><i>Congressional Add:</i></b> Program increase - Altitude chamber infrastructure upgrades	4.817	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology, Project 64093, Missile Rocket Propulsion Integ & Demo.		
<b><i>Congressional Add:</i></b> Advanced hybrid engine rocket development	4.817	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology, Project 64093, Missile Rocket Propulsion Integ & Demo.		
<b>Congressional Adds Subtotals</b>	9.634	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>				<b>Project (Number/Name)</b> 634921 / <i>Aircraft Propulsion Subsystems Int</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
634921: <i>Aircraft Propulsion Subsystems Int</i>	-	40.312	17.411	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates technology to increase turbine engine operational reliability, durability, mission flexibility, and performance while reducing weight, fuel consumption, and cost of ownership. The Aircraft Propulsion Subsystems Integration (APSI) project includes demonstrator engines for manned systems and efficient small-scale propulsion for remotely piloted aircraft and cruise missile applications. The demonstrator engines integrate the core (high- pressure spool) technology developed under a joint multi-agency and aerospace industry project with the engine (low-pressure spool) technology such as fans, turbines, engine controls, mechanical systems, exhaust nozzles, and augmentors. Additionally, this project includes activities to improve propulsion safety and readiness. This project also focuses on integration of inlets, nozzles, engine-to-airframe compatibility, and power and thermal management subsystems technologies. The APSI project provides aircraft with potential for longer range and higher cruise speeds with lower specific fuel consumption, surge power for successful engagements, high sortie rates with reduced maintenance, reduced life cycle cost, and improved survivability, resulting in increased mission effectiveness. Technologies developed are applicable to sustained high-speed vehicles and responsive space launch. The Aircraft Propulsion Subsystems Integration project is focused on improving propulsion capabilities while at the same time reducing the cost of ownership. Anticipated technology advances include turbine engine improvements providing approximately twice the range for a sustained supersonic combat aircraft, doubling the time on station with ten times the power output for surveillance aircraft and propulsion for a high speed supersonic missile with double the range for time sensitive targets.

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.

In FY2023, Core Engine Technologies, High Pressure Ratio Core Engine Technologies, and Adaptive Turbine Engine Core Technology efforts transferred from Program 0603216F, Aerospace Propulsion & Power Technology, Project 63681B, Advanced Turbine Engine Gas Generator to Program 0603216F, Aerospace Propulsion and Power Technology, Project 634921, Aircraft Propulsion Subsystems Integration in order to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 634921 Aircraft Propulsion Subsystems Int, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Missile/Remotely Piloted Aircraft Engine Performance	10.827	13.961	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>	<b>Project (Number/Name)</b> 634921 / <i>Aircraft Propulsion Subsystems Int</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>Description:</b> Design, fabricate, and test component technologies for limited-life engines to improve the performance, durability, and affordability of missile and remotely piloted aircraft engines.</p> <p><b>FY 2024 Plans:</b> Complete next innovative architecture, critical technologies and component designs for efficient small engines. Continue operational benefits analysis for missile and unmanned aerial vehicle (UAV) systems. Continue development of pervasive, hydrocarbon pressure gained propulsion fueled technologies. Continue advanced development in rotating detonation engine technologies to advance powered munitions. Initiate new engine technologies to deliver reduced takeoff length, increased range, loiter, combat maneuverability, and lower cost for attritable UAS in contested environments.</p> <p><b>FY 2025 Plans:</b> - Starting in FY 2025, this work will be performed under PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int, Expendable/Autonomous Vehicle Engine Capability effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$13.961 million. Funding decreased due to transfer of Missile/Remotely Piloted Aircraft Engine Performance effort to PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int, Expendable/Autonomous Vehicle Engine Capability effort.</p>			
<p><b>Title:</b> Adaptive Turbine Engine Technologies</p> <p><b>Description:</b> Design, fabricate, and demonstrate performance, durability, and operability technologies to mature adaptive turbine engine technologies.</p> <p><b>FY 2024 Plans:</b> Not Applicable</p> <p><b>FY 2025 Plans:</b> Not Applicable</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable</p>	3.965	0.000	0.000
<p><b>Title:</b> Core Engine Technologies</p> <p><b>Description:</b> Design, fabricate, and demonstrate performance predictions in core engines, using innovative engine cycles and advanced materials for turbofan and for turbojet engines.</p> <p><b>FY 2024 Plans:</b></p>	7.582	1.972	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>	<b>Project (Number/Name)</b> 634921 / <i>Aircraft Propulsion Subsystems Int</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Continue core tests for medium scale engines maturing key technologies. Continue risk reduction component tests for medium-scale engine advanced fan and core. Continue advanced propulsion air frame integration experiments to enable embedded propulsion systems.</p> <p><b>FY 2025 Plans:</b> - Starting in FY 2025, this work will be performed under PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int, Core Engine Technologies effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$1.972 million. Funding decreased due to transfer of Core Engine Technologies effort to PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int, Core Engine Technologies effort.</p>				
<p><b>Title:</b> High Pressure Ratio Core Engine Technologies</p> <p><b>Description:</b> Design, fabricate, and demonstrate high overall pressure ratio engine cores to provide increased durability and affordability with lower fuel consumption for turbofan and for turboshaft engines.</p> <p><b>FY 2024 Plans:</b> Complete assembly of advanced concept additive manufacturing heat exchanger for small core engines. Complete fabrication of recuperator for demonstration of increased core efficiency in small core engines. Continue to work and mature medium scale core technologies.</p> <p><b>FY 2025 Plans:</b> - Starting in FY 2025, this work will be performed under PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int, High Pressure Ratio Core Engine Technologies effort.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$1.478 million. Funding decreased due to transfer of High Pressure Ratio Core Engine Technologies effort to PE 0603211F, Aerospace Technology Dev/Demo, Project 634921 Aircraft Propulsion Subsystems Int, High Pressure Ratio Core Engine Technologies effort.</p>		1.295	1.478	0.000
<p><b>Title:</b> Adaptive Turbine Engine Core Technologies</p> <p><b>Description:</b> Design, fabricate, and demonstrate adaptive turbine engine cores to provide increased durability and affordability with lower fuel consumption for turbofan and for turboshaft engines.</p> <p><b>FY 2024 Plans:</b></p>		0.131	0.000	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>	<b>Project (Number/Name)</b> 634921 / <i>Aircraft Propulsion Subsystems Int</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
Not Applicable			
<b>FY 2025 Plans:</b> Not Applicable			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable			
<b>Accomplishments/Planned Programs Subtotals</b>	23.800	17.411	0.000

	<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Low spool generator capabilities	4.634	-
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology.		
<b>Congressional Add:</b> Program increase - turbo air cool HTPEM hydrogen fuel cell development	11.878	-
<b>FY 2023 Accomplishments:</b> Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology.		
<b>Congressional Adds Subtotals</b>	16.512	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>				<b>Project (Number/Name)</b> 635098 / <i>Advanced Aerospace Propulsion</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
635098: <i>Advanced Aerospace Propulsion</i>	-	16.792	23.266	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates, via ground and flight tests, the scramjet propulsion cycle to a technology readiness level appropriate for full integration with other engine cycles (including turbine and rocket-based) to provide the Air Force with transformational military capabilities. The primary focus is on the hydrocarbon-fueled, scramjet engine. Multi-cycle engines will provide the propulsion systems for possible application to support aircraft and weapon platforms. Efforts include: scramjet flow-path optimization to enable operation over the widest possible range of Mach numbers; active combustion control to assure continuous positive thrust (even during mode transition); robust flame-holding to maintain stability through flow distortions; and maximized volume-to-surface area to minimize the thermal load imposed by the high-speed engine. Thermal management plays a vital role in scramjet and combined cycle engines, including considerations for protecting low speed propulsion systems (e.g., turbine engines) during hypersonic flight.

In FY 2025, the entirety of PE 0603216F, Aerospace Propulsion and Power Technology, Project 635098 Advanced Aerospace Propulsion, is transferred to PE 0603211F, Aerospace Technology Dev/Demo, Project 634926 High Speed Systems Integ & Demo.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Scramjet Technologies	16.792	23.266	0.000
<b>Description:</b> Develop and demonstrate technologies for a hydrocarbon-fueled scramjet with robust operation.			
<b>FY 2024 Plans:</b> Continue development and integration of larger scale scramjet component technologies to enhance operability including robust operation during maneuvers and extended operating time. Continue development and demonstration of tactically-relevant, scramjet engine designs, technologies, and components including ground and flight demonstrations needed for potential follow-on acquisition program. Continue propulsion technology maturation activities for multi-mission cruiser concept to expand performance capabilities of high speed systems. Initiate integration of scramjet components into expendable hypersonic multi-mission ISR and Strike demo design.			
<b>FY 2025 Plans:</b> - Starting in FY 2025, this work will be performed under PE 0603211F, Aerospace Technology Dev/Demo, Project 634926 High Speed Systems Integ & Demo, Scramjet Technologies effort.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>			



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603216F / <i>Aerospace Propulsion and Power Technology</i>	<b>Project (Number/Name)</b> 635098 / <i>Advanced Aerospace Propulsion</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 decreased compared to FY 2024 by \$23.266 million. \$12.109 million of the decrease is due to the transfer of Scramjet Technologies effort to PE 0603211F, Aerospace Technology Dev/Demo, 634926 High Speed Systems Integ & Demo, Scramjet Technologies effort. \$11.157 million of the decrease is due to re-prioritization to meet the nation's future security needs.			
<b>Accomplishments/Planned Programs Subtotals</b>	16.792	23.266	0.000

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

**THIS PAGE INTENTIONALLY LEFT BLANK**

**UNCLASSIFIED**

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	32.338	32.510	36.445	0.000	36.445	37.374	37.429	38.795	39.607	Continuing	Continuing
633720: <i>EW Quick Reaction Capabilities</i>	-	18.627	19.552	22.125	0.000	22.125	22.696	22.741	23.571	24.064	Continuing	Continuing
63431G: <i>RF Warning &amp; Countermeasures Tech</i>	-	8.022	12.876	14.320	0.000	14.320	14.678	14.688	15.224	15.543	Continuing	Continuing
634335: <i>Cyber Concepts</i>	-	3.352	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
63691X: <i>EO/IR Warning &amp; Countermeasures Tech</i>	-	2.337	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops and demonstrates technologies to support Air Force electronic combat warfighting capabilities. The program focuses on developing components, subsystems, and technologies with potential aerospace, special operations, and airlift electronic combat applications. It develops and demonstrates technologies for integrating electronic combat sensors and systems into a fused and seamless whole. It integrates and focuses research efforts in electronic warfare and cyber warfare to rapidly demonstrate a capability for rapid fielding. It develops and demonstrates technologies for navigation and timing in radio frequency (RF) contested and denied environments. It develops and demonstrates advanced technologies for radio frequency electronic combat suites and advanced warning and countermeasure technologies to defeat electro-optical, infrared, and laser threats to aerospace platforms. It also develops and demonstrates technologies that will enable mission systems to be more resilient, agile, autonomous, and be able to operate in multiple domains. This program has been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, and 0602298F.

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.

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force</i> / BA 3: <i>Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>
---	---

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	31.037	32.510	36.372	0.000	36.372
Current President's Budget	32.338	32.510	36.445	0.000	36.445
Total Adjustments	1.301	0.000	0.073	0.000	0.073
• 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	3.100	0.000			
• SBIR/STTR Transfer	-0.557	0.000			
• Other Adjustments	-1.242	0.000	0.073	0.000	0.073

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>				<b>Project (Number/Name)</b> 633720 / <i>EW Quick Reaction Capabilities</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
633720: <i>EW Quick Reaction Capabilities</i>	-	18.627	19.552	22.125	0.000	22.125	22.696	22.741	23.571	24.064	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project establishes a capability to rapidly assess, develop and demonstrate new electronic warfare concepts, techniques, and capabilities as well as the required position navigation and timing technologies and capabilities in the context of systemic electronic warfare effects (electronic warfare threat interactions) in a congested/contested electromagnetic spectrum, system-of-systems environment of the future. It develops disruptive electronic warfare and countermeasures concepts specifically selected for high-impact, game-changing effects; evaluates them in high fidelity virtual and hardware evaluation settings; and demonstrates them in an operationally relevant environment. It establishes and maintains an all-source, physics-based, threat-to-countermeasures electronic warfare systems engineering methodology. It develops a core analytic function, supported by simulation-based wargaming and interactive engineering modeling capabilities to evaluate advanced countermeasures concepts.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Radio Frequency Electronic Warfare	3.576	0.000	0.000
<b>Description:</b> Develop electronic warfare focused knowledge databases, engineering models, mission simulations, analysis tools and assessment environments which enable the development of multi-domain electronic warfare technologies. The primary focus is on emulating complex battlespace radio frequency environments, electronic attack effects against emerging, networked weapon systems, and assessing flexible, software-defined electronic warfare systems with non-deterministic performance (for example, utilizing cognitive algorithms).			
<b>FY 2024 Plans:</b> FY 2024 funding and technical work from this effort has been realigned to Program Electronic Combat Technology, 0603270F; Project EW Quick Reaction Capabilities, 633720; Integrated EW Demonstration effort.			
<b>FY 2025 Plans:</b> Not Applicable			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable			
<b>Title:</b> Resilient Positioning, Navigation and Timing	10.522	11.108	11.932
<b>Description:</b> Develop and transition robust Global Navigation Satellite System capabilities; resilient complementary position, navigation and timing techniques; precise position, navigation and timing technologies for distributed sensing/effects; position,			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 633720 / <i>EW Quick Reaction Capabilities</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>navigation and timing technology to provide position, navigation and timing electronic warfare situational awareness and training; and position, navigation and timing architectures to enable resiliency against the rapidly evolving threat. Efforts will include prototypes and relevant Open Architecture standards where applicable to enable timely technology transition.</p> <p><b>FY 2024 Plans:</b> Continue maturation and transition of technologies for characterization of geolocation of sources interfering with navigational satellite signals. Continue developing and flight demonstrate a transcoder that converts trusted navigation sources such as modernized military Global Positioning System signals into synthesized radio frequency directly injected and useable by legacy Department of Defense Global Positioning System receivers. Continue algorithm efforts to authenticate signals as emanating directly from foreign navigation satellites. Continue developing, demonstrate, and promulgate navigational open architecture standards to permit integration of alternative/complementary position, navigation and timing approaches into future Department of Defense systems, such as the resilient embedded Global Positioning System-inertial program of record.</p> <p><b>FY 2025 Plans:</b> - Continue development of technologies to establish and maintain resilient and robust positioning, navigation, and timing capabilities for airborne platforms in environments, in particular over vast spans of water. - Continue to integrate these technologies into the reference implementations aligned with the resilient embedded global positioning system-inertial and positioning, navigation and timing software defined user equipment programs of record. - Continue developing, demonstrating, and promulgating navigational open architecture standards to permit integration of alternative position, navigation and timing approaches into future Department of Defense systems.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$0.824 million. Justification for this increase is described in plans above.</p>			
<p><b>Title:</b> Electro-Optical/Infrared Warfare Demonstrator</p> <p><b>Description:</b> Develop next generation countermeasure techniques to address the complete range of multispectral (for example, dual band infrared) threats including advanced techniques versus advanced man portable air defense system and air-to-air threats with multimode capabilities. Develop capabilities for situational awareness and countermeasure to integrated air defense systems and associated multispectral threats.</p> <p><b>FY 2024 Plans:</b> FY 2024 funding and technical work from this effort has been realigned to Program Electronic Combat Technology, 0603270F; Project EW Quick Reaction Capabilities, 633720; Integrated EW Demonstration effort.</p> <p><b>FY 2025 Plans:</b></p>	4.529	0.000	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 633720 / <i>EW Quick Reaction Capabilities</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
Not Applicable				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Not Applicable				
<b>Title:</b> Integrated EW Demonstration		0.000	8.444	10.193
<b>Description:</b> Integrate emerging technologies to develop and demonstrate electromagnetic warfare spectrum dominance concepts, technologies and techniques. Goal is to counter advanced complex electromagnetic threats in contested environments across radio frequency and electro-optic/infrared spectrums.				
<b>FY 2024 Plans:</b> Continue the implementation of emerging electromagnetic attack and support capabilities into open architectures to support electromagnetic spectrum operations. Continue using agile development processes to demonstrate the capability to rapidly respond to new and unexpected complex emitters in realistic radio frequency environments. Continue expansion and maturation of modeling, simulation and laboratory assessment environments commensurate with technologies being researched, developed and tested including cognitive and autonomous electronic warfare technologies for multi-spectral treats in a complex electromagnetic environment. Continue iterating and refreshing techniques for data collection capabilities to enhance research and development efforts. Continue analysis from field test to develop requirements for proactive detection and situation awareness for multiple Department of the Air Force platforms.				
<b>FY 2025 Plans:</b> - Continue the implementation of emerging electromagnetic attack and support capabilities based on operational objectives and analysis of field test results. - Continue using agile development processes to enhance the capability to rapidly respond to new and unexpected complex emitters in greater volume and in less time. - Continue expansion and maturation of modeling, simulation and laboratory capabilities for the assessment of cognitive and autonomous electronic warfare technologies for multi-spectral treats in a complex electromagnetic environment. - Continue iterating and refreshing techniques for data collection capabilities and operational test events to enhance research and development efforts. - Continue analysis from field tests to meet operational requirements for proactive detection and situation awareness for multiple Department of the Air Force platforms.				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>				

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 633720 / <i>EW Quick Reaction Capabilities</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 increased compared to FY 2024 by \$1.749 million. Increase is a result of increased emphasis in the expansion and maturation of modeling and simulation capabilities for cognitive and autonomous technologies.			
<b>Accomplishments/Planned Programs Subtotals</b>	18.627	19.552	22.125

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>				<b>Project (Number/Name)</b> 63431G / <i>RF Warning &amp; Countermeasures Tech</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
63431G: <i>RF Warning &amp; Countermeasures Tech</i>	-	8.022	12.876	14.320	0.000	14.320	14.678	14.688	15.224	15.543	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates advanced technologies for radio frequency electronic combat suites, including the required navigation technologies and capabilities, to enhance the survivability of aerospace vehicles and to provide crew situational awareness. The research addresses technologies for missile/threat warning, radio frequency receivers, electronic combat pre-processors, advanced sorting/pre-processing algorithms, and expert software for applications on existing and future electronic combat systems. The research also focuses on the development and demonstration of subsystems and components for generating on-board/off-board radio frequency countermeasure techniques to address the complete range of multispectral threats with multimode capabilities. Develops capabilities for situational awareness and countermeasures to integrated air defense systems and associated multispectral threats. Develops electromagnetic warfare focused knowledge databases, engineering models, mission simulations, analysis tools and assessment environments which enable the development of multi-domain multi-spectral electromagnetic warfare technologies. This includes the development of electronic countermeasures techniques, as well as advanced electronic countermeasures technologies such as antennas, power amplifiers, and preamplifiers. This project also aims to develop cyber resilience and protect systems through adaptation of the system to the threat. It demonstrates these technologies in open and adaptable architectures for system integration in field demonstrations and proves out the technologies through rapid integration of sensors and architectures for technology transition.

In FY 2024 and FY 2025, in order to better execute these converging efforts in the Multi-Spectral domain, funding and technical work was transferred into this BPAC from "Program 0603270F Electronic Combat Technology, Project 634335: Cyber Concepts, effort Resilient and Agile Mission Systems Architecture" and "Program 0603270F Electronic Combat Technology, Project 63691X: EO/IR Warning & Countermeasures Tech, effort Advanced Electro-Optical/Infrared Warning and Countermeasure Technologies"

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Spectrum Dominance Technology Demonstrations	8.022	12.876	14.320
<b>Description:</b> Develop aerospace platform jamming concepts, technologies and techniques to counter advanced radio frequency threats associated with current and future aerospace weapon systems. Provide position, navigation and system resilience via open architecture solutions.			
<p>Note: In FY 2023 and prior this Thrust was titled "Radio Frequency Electronic Warfare Demonstrator"                      This change was made to accommodate the transfer of funding and technical work to this Effort from "Program 0603270F Electronic Combat Technology, Project 634335: Cyber Concepts, effort Resilient and Agile Mission Systems Architecture" and "Program 0603270F Electronic Combat Technology, Project 63691X: EO/IR Warning &amp; Countermeasures Tech, effort Advanced</p>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 63431G / <i>RF Warning &amp; Countermeasures Tech</i>

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Electro-Optical/Infrared Warning and Countermeasure Technologies" in order to better execute these converging efforts in the Multi-Spectral domain.</p> <p><b>FY 2024 Plans:</b>                      Complete the Radio Frequency Electronic Warfare Demonstrator effort and deliver a software-centric cognitive electromagnetic warfare-based rapid reprogramming system to the 350th Spectrum Warfare Wing to improve next sortie reprogramming capability against complex emitters. These deliverables include cognitive electromagnetic warfare applications integrated into an on-station system to support electromagnetic spectrum maneuverability and data analytics and visualization tools to assess system performance for reprogramming.                      Continue expansion and maturation of modeling, simulation and laboratory assessment environments commensurate with technologies being researched, developed and tested including cognitive and autonomous electronic warfare technologies for multi-spectral treats in a complex electromagnetic environment. Continue the implementation and development of spectrum warfare's integration into Reference Architecture Implementations and open architectures standards to support modeling and simulation analysis. Continue conducting technology demonstrations to support transition into Air Force platforms and electromagnetic spectrum operations units. Continue maturing the process for threat characterization and countermeasures development and field testing of new advanced threats to include laser jam codes and techniques. Continue effectiveness assessment of laser and missile warning technologies and techniques for a variety of Air Force platforms. Continue development of advanced networking, processing, advanced computing paradigms, and cybersecurity technologies for next-generation avionics mission system capabilities. Continue utilizing agile development processes and digital engineering techniques for rapid and affordable development, integration, and demonstrations to rapidly respond to new and unexpected complex emitters in realistic radio frequency environments.</p> <p><b>FY 2025 Plans:</b>                      - Initiate effort to develop and assess multi-spectral electromagnetic support and attack concepts and technologies against emerging threats, from feedback of completed Radio Frequency Electronic Warfare Demonstrator effort.                      - Continue assessing operational and program office requirements to determine multi-spectral shortfalls and determine applicable modeling &amp; simulation to evaluate shortfalls and potential technologies to address these shortfalls.                      - Continue expansion and maturation of modeling, simulation and laboratory assessment environments commensurate with technologies being researched, developed, and tested; including cognitive and autonomous electronic warfare technologies for multi-spectral treats in a complex electromagnetic environment.                      - Continue multi-spectral development within Reference Architecture Implementations and open architectures standards to support enhanced modeling, simulation and assessment.                      - Continue conducting technology demonstrations to support transition into Air Force platforms and electromagnetic spectrum operations units.</p>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 63431G / <i>RF Warning &amp; Countermeasures Tech</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue threat characterization, countermeasures development, and field testing of new advanced threats; new advanced threats to include laser jam codes and techniques.</li> <li>- Continue effectiveness assessment of laser and missile warning technologies and techniques for a variety of Air Force platforms.</li> <li>- Continue development of advanced networking, processing, advanced computing paradigms, and cybersecurity technologies for next-generation avionics mission system capabilities.</li> <li>- Continue utilizing agile development processes and digital engineering techniques to further accelerate development, integration, and demonstrations to rapidly respond to new and unexpected complex emitters in realistic radio frequency environments.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 increase compared to FY 2024 by \$1.444 million. Funding increased due to increased emphasis in multi-spectral electromagnetic support and attack concepts and technologies. Funding increase also due to realignment of technical scope to this effort from 0603270F Electronic Combat Technology, Project 634335: Cyber Concepts, effort Resilient and Agile Mission Systems Architecture.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	8.022	12.876	14.320

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 634335 / <i>Cyber Concepts</i>
--	---	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
634335: <i>Cyber Concepts</i>	-	3.352	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates methods to discover cyber susceptibilities, assess avionics systems, formulate mitigation strategies, and investigate use of tools and technologies to automate this process. It is designed to apply developed vulnerability discovery, vulnerability mitigation, and cyber protection technology to avionics systems and components and embedded systems. This involves technologies for trusted sensors and trusted systems that deter exploitation of our critical hardware and software. This project aims to develop cyber resilience and protect systems through adaptation of the system to the threat. It demonstrates these technologies in open and adaptable architectures for system integration in field demonstrations and proves out the technologies through rapid integration of sensors and architectures for technology transition. It integrates research efforts in electronic and cyber warfare to rapidly demonstrate a capability for rapid fielding.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<b>Title:</b> Resilient and Agile Mission Systems Architecture	3.352	0.043	0.000
<b>Description:</b> This effort performs advanced development and demonstration of methods, technologies, and tools to enable resilience and protect mission systems against threats. This involves open and adaptable architectures for rapid integration and agile systems, cyber protections and resilience technologies to protect against threats. It integrates research efforts in electronic and cyber warfare to demonstrate novel operational capabilities through laboratory, field, and flight tests and experimentation. The goal is to reduce risk for rapid transition of novel operational capabilities into Department of the Air Force mission systems.			
<b>FY 2024 Plans:</b> Continue transfer of technical work while it realigns under Program 0603270F Electronic Combat Technology, Project 63431G: RF Warning & Countermeasures Tech, effort Spectrum Dominance Technology Demonstrations.			
<b>FY 2025 Plans:</b> Not Applicable			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.043 million. Funding decreased due to realignment of this effort to Program 0603270F Electronic Combat Technology, Project 63431G: RF Warning & Countermeasures Tech, effort Spectrum Dominance Technology Demonstrations.			
<b>Accomplishments/Planned Programs Subtotals</b>	3.352	0.043	0.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603270F / <i>Electronic Combat Technology</i>	Project (Number/Name) 634335 / <i>Cyber Concepts</i>

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 63691X / <i>EO/IR Warning &amp; Countermeasures Tech</i>
--	---	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
63691X: <i>EO/IR Warning &amp; Countermeasures Tech</i>	-	2.337	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates the advanced warning and countermeasure technologies required to negate electro-optical/infrared and laser threats to aerospace platforms. Develops off-board (decoys and expendables) and on-board countermeasure technologies for aircraft self-protection to provide robust, affordable solutions for protection against infrared missiles with autonomous seekers, multi-spectral threats, laser-guided weapons, and electro-optical/infrared tracking systems used to direct electro-optical/infrared and radar-guided missiles.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<b>Title:</b> Advanced Electro-Optical/Infrared Warning and Countermeasure Technologies	2.337	0.039	0.000
<b>Description:</b> Analyze the vulnerabilities of current infrared missile systems and future imaging infrared sensors. Develop advanced countermeasure system techniques to exploit vulnerabilities for use against infrared and electro-optical guided missile threats. Develop advanced optical and infrared sensor systems for airborne and space situational awareness and threat warning.			
<b>FY 2024 Plans:</b> Continue transfer of technical work while it realigns under Program 0603270F Electronic Combat Technology, Project 63431G: RF Warning & Countermeasures Tech, effort Spectrum Dominance Technology Demonstrations.			
<b>FY 2025 Plans:</b> Not Applicable			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.039 million. Funding decreased due to realignment of this effort to Program 0603270F Electronic Combat Technology, Project 63431G: RF Warning & Countermeasures Tech, effort Spectrum Dominance Technology Demonstrations.			
<b>Accomplishments/Planned Programs Subtotals</b>	2.337	0.039	0.000

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 63691X / <i>EO/IR Warning &amp; Countermeasures Tech</i>

**D. Acquisition Strategy**

Not applicable

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force / BA 3: Advanced Technology Development (ATD)	<b>R-1 Program Element (Number/Name)</b> PE 0603273F / Science & Technology for Nuclear Re-entry Systems
---	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	22.893	70.321	91.885	0.000	91.885	127.244	164.414	170.367	173.931	Continuing	Continuing
634094: Next Gen Platform Dev/ Demo	-	22.893	70.321	91.885	0.000	91.885	127.244	164.414	170.367	173.931	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**  
NOTE: Funding was realigned into this PE/Project from PE 0603211F / Aerospace Technology Dev/Demo, Project 634094: Next Gen Platform Dev/ Demo.

**A. Mission Description and Budget Item Justification**

This project demonstrates advanced nuclear-related components and technologies in support of the nuclear enterprise, nuclear deterrence operations missions, and integrated deterrence operations. Next Gen Platform Development/Demonstration efforts are accomplished through development, integration, experimentation, and evaluation of various technologies to include fuzes, aeroshells, inertial guidance, and strategic radiation hardened communications for demonstration in near-realistic operational environments. This program supports Department of Defense (DoD) priorities for enduring nuclear science and technology (S&T) for nuclear delivery systems. This effort will provide advanced technology development that will effectively address evolving threats and maintain operational effectiveness while also aligning with the highest-level guidance for nuclear forces identified in the 2022 Nuclear Posture Review and National Defense Strategy. This effort will contribute to preserving the viability of the nuclear deterrent in a cost-effective manner by reducing technical and programmatic risk associated with execution of the overall nuclear modernization program. This effort will advance materials and manufacturing methods to develop new, manufacturable options to increase capability and reduce cost for re-entry systems. These ends will be reached by developing technologies to inform future system requirements, establishing interagency partnerships for re-entry system platform development and infrastructure modernization, revitalizing nuclear workforce talent, and coordinating with existing programs for next generation strategic system development. Technology that enhanced and enabled this program in Program Element 0603211F Project 634094 was realigned into this PE for clarity and traceability.

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 program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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.

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	<b>R-1 Program Element (Number/Name)</b> PE 0603273F I Science & Technology for Nuclear Re-entry Systems
---	---

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	27.031	70.321	88.464	0.000	88.464
Current President's Budget	22.893	70.321	91.885	0.000	91.885
Total Adjustments	-4.138	0.000	3.421	0.000	3.421
• 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	-0.950	0.000			
• Other Adjustments	-3.188	0.000	3.421	0.000	3.421

**Change Summary Explanation**

The FY 2025 funding request was reduced by \$3.500 million to account for the availability of prior year execution balances.

FY 2025 funding increased due to the transfer from PE 0603211F, Aerospace Technology Dev/Demo, efforts to PE 0603273F, Next Generation Platform Dev/Demo.

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>Title:</b> Re-entry System Technologies</p> <p><b>Description:</b> Develop next generation hardware, software and material technologies for flight representative testing and environments for re-entry systems.</p> <p><b>FY 2024 Plans:</b> Plans are spread between new thrusts in FY 2024</p> <p><b>FY 2025 Plans:</b> Plans are spread between thrusts in FY 2025</p>	22.893	0.000	0.000
<p><b>Title:</b> Aeroshell Technologies</p> <p><b>Description:</b> Develop next-generation material technologies and Government Reference Designs (GRD) for flight representative environments and experimentation for multi-service re-entry systems characterization.</p> <p><b>FY 2024 Plans:</b></p>	0.000	24.487	29.734

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603273F / <i>Science &amp; Technology for Nuclear Re-entry Systems</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Continue development of advanced aeroshell technologies to maintain a viable deterrent through modeling and simulation (M&amp;S) of re-entry environments (being supported by PE 0602201F). Initiate advanced M&amp;S development to characterizing re-entry environment. Initiate update to M&amp;S integrated solvers for enhanced analysis workflow with inclusion of an advanced physics-based re-entry characterization protocol for decreased computational time. Initiate benchtop experimentation supporting M&amp;S code validation.</p> <p>Continue aeroshell materials trade studies and procurement of material coupons. Initiate iterative material characterization and benchtop experimentation to build materials database. Initiate additional material development for future benchtop experimentation. Initiate trade studies and requirements of material sample experimentation for integration onto platform generating a combined effects environment.</p> <p>Initiate development of GRD platforms through requirements development and with continued design trade studies and optimization. Initiate manufacturing process trade studies and analysis. Initiate model-based systems engineering approach for future GRD development build and risk reduction. Initiate investigations into sourcing options for outer aeroshell materials and high-temperature GRD components.</p> <p>Initiate requirements development supporting component integration onto a future launch platform. Initiate required test-bed design trades and/or modifications, including instrumentation options for future flight characterization and analysis capabilities.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>-Continue development of advanced aeroshell technologies to maintain a viable deterrent through M&amp;S of re-entry environments (being supported by PE 0602201F) and initiate technology development for enhance GRD testing capabilities.</li> <li>-Continue advanced M&amp;S development to characterizing re-entry environments and update to M&amp;S integrated solvers for enhanced analysis workflow with inclusion of an advanced physics-based re-entry characterization protocol for decreased computational time. Continue benchtop experimentation supporting M&amp;S code validation.</li> <li>-Complete aeroshell materials trade studies, procurement of material coupons, iterative material characterization, and benchtop experimentation to build materials database. Complete additional material development for future benchtop experimentation.</li> <li>-Continue trade studies and requirements of material sample experimentation for integration onto platform generating a combined effects environment.</li> <li>-Initiate test planning for a combined effects environment.</li> </ul>				

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603273F / <i>Science &amp; Technology for Nuclear Re-entry Systems</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>-Continue development of a GRD platform through requirements development with continued design trade studies and optimization. Continue manufacturing process trade studies and analysis as well as model-based systems engineering approach for future GRD development build and risk reduction. Continue investigations into sourcing options for outer aeroshell materials and high-temperature GRD components.</p> <p>-Complete requirements development supporting component integration onto a future launch platform.</p> <p>-Complete required test-bed design trades and/or modifications, including instrumentation options for future flight characterization and analysis capabilities.</p> <p>-Initiate planning for future GRD integration, test, and evaluation activities.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$5.247 million. FY 2025 increased due to planned purchase of long lead items for the GRD and subsystem integration design work for low level experimentation on the ground and during re-entry.</p>			
<p><b>Title:</b> Advanced Fuzing Technologies</p> <p><b>Description:</b> Develop next-generation fuzing solutions which maintain operational effectiveness against emerging targeting challenges and develop alternative safety and surety features required for nuclear systems.</p> <p><b>FY 2024 Plans:</b> Continue the development of advanced fuzing solutions which maintain operational effectiveness against emerging targeting challenges and threat environments. Initiate research into integrated guidance/fuzing solutions which are capable of synthesizing positional information with altitude measurement. Initiate advanced fuzing design requirements. Initiate the development of hardware concepts for advanced fuzing architectures. Initiate experimentation on advanced impact fuze technologies.</p> <p><b>FY 2025 Plans:</b> -Continue the development of advanced fuzing solutions to improve reliability with non-ballistic vehicles. -Continue development of integrated guidance/fuzing solutions and complete evaluation of advanced fuzing requirements. -Continue development of experimental impact fuze technologies. -Continue development of MK21A dual-use fuze design. -Complete delivery of advanced impact fuze P0 for testing and integration. -Continue development of prototypes for design, build and preliminary testing. -Initiate integration planning of advanced guidance with fuzing architecture and target optimization algorithms.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	0.000	9.341	9.079

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603273F / <i>Science &amp; Technology for Nuclear Re-entry Systems</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 decreased compared to FY 2024 by 0.262 million. Funding decreased due to decreased emphasis in advanced fusing technologies.				
<p><b>Title:</b> Advanced Guidance, Navigation and Control (GNC) Technologies</p> <p><b>Description:</b> Develop next generation, strategic level radiation hardened GNC technologies and solutions, including sensors, systems, aides and control elements to support GNC requirements in relevant environments.</p> <p><b>FY 2024 Plans:</b> Continue strategic-grade, solid-state radiation-hardened guidance solution development and radiation component testing reinforcing nuclear efforts in PE 0603211F.</p> <p>Initiate design of high-gravity (high-g) accelerometer Application Specific Integrated Circuits (ASIC). Initial delivery of solid-state, high-g accelerometer advanced technological development characterization and insertion into inertial measurement unit (IMU) future architecture. Initiate and complete solid-state, low-g accelerometer development unit design/build and initiate integration into IMU.</p> <p>Initiate benchtop experimentation of resonant fiber optic gyroscope (RFOG), including multiple component level design, testing and experimentation, to inform the iterative development of ensuing RFOG design. Initiate final RFOG design trades and develop mechanical flight architectures. Initiate risk reduction activities for RFOG components, including fiber improvement, radiation hardened parts development, and light source performance.</p> <p>Initiate IMU concept development and maturation through the design, build and environmental testing of inertial sensor components. Initiate purchase of long-lead IMU components. Initiate bench-level characterization for IMU system with early sensor designs. Initiate IMU radiation-hardened electronics design, build and analysis. Initiate risk reduction to meet future follow-on evaluation opportunities. Initiate requirements development in support of inertial sensor component integration for future re-entry testbed flight.</p> <p><b>FY 2025 Plans:</b> -Continue strategic-grade, solid state radiation-hardened guidance solution development and radiation component testing reinforcing nuclear efforts.</p> <p>-Continue design of high-g accelerometer ASICs and the delivery of solid-state, high-g accelerometer advanced technological development characterization and insertion into IMU future architecture.</p>		0.000	20.218	27.828

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603273F / <i>Science &amp; Technology for Nuclear Re-entry Systems</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p>-Continue benchtop experimentation of RFOG, including multiple component level design, testing and experimentation, to inform the iterative development of ensuing RFOG design. Continue final RFOG design trades and develop mechanical flight architectures. Continue risk reduction activities for RFOG components, including fiber improvement, radiation hardened parts development, and light source performance.</p> <p>-Continue IMU concept development and maturation through the design, build, and environmental testing of inertial sensor components. Complete purchase of long-lead IMU components and continue bench-level characterization for IMU system with early sensor designs. Continue IMU radiation-hardening electronics design, build and analysis and risk reduction to meet future follow-on evaluation opportunities. Initiate covariance analysis improvement through sensor/system test data inputs to predict IMU performance. Complete requirements development in support of inertial sensor component integration for future re-entry testbed flight.</p> <p>-Initiate and complete delivery of strategic grade rad-hard gyroscope in final form factor for FY 2026 insertion into IMU as well as future inertial sensor designs of quantum IMUs.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$7.61 million. Funding increased due to the initiation of efforts to develop strategic grade rad-hard gyroscope in final form factor for FY 2026 insertion into Inertial Measurement Unit (IMU) as well as future inertial sensor designs of quantum IMUs.</p>			
---	--	--	--

<p><b>Title:</b> Integration, Experimentation, and Evaluation Solutions</p> <p><b>Description:</b> Development of inherent government expertise through integration and experimentation laboratories. This capability enables S&amp;T for current and future nuclear re-entry systems and component Technology Readiness Level (TRL) maturation through Government Reference Designs (GRDs) in strategic environments.</p> <p><b>FY 2024 Plans:</b> Continue establishing requisite testing infrastructure to enable nuclear re-entry science and technology (S&amp;T) development activities and to evaluate component technologies in relevant environments. Initiate procurement of long-lead time special equipment for installation into government integration facilities. Initiate and complete design of radiographic facility to support imaging for high-fidelity demonstrators and begin procurement of radiographic equipment.</p> <p>Initiate the development of enhanced ground and complementary experimentation capabilities. Initiate and complete high-gravity, high-precision centrifuge designs. Initiate build supporting strategic-grade inertial sensor characterization and validation to meet Guidance, Navigation, and Control (GNC) analytic activities for future flight to achieve Inertial Measure Unit (IMU) TRL 6. Initiate</p>	0.000	16.275	25.244
---	-------	--------	--------

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603273F / <i>Science &amp; Technology for Nuclear Re-entry Systems</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p>the development of a recoverable re-entry testbed supporting modeling and simulation (M&amp;S) validation and component TRL maturation through interim design review. Initiate integration planning activities for recoverable flight unit.</p> <p>Initiate functional requirements development to establish an integration strategy and proposed test plan in relation to GNC technologies and telemetry for future flight. Initiate planning and requirements development activities for enduring GRD flights. Initiate and complete planning and development of integration and radiographic facility operations, roadmaps, and procedures.</p> <p>Initiate in-house employee training program, supporting enduring expertise for integration, experimentation and evaluation activities for future flight demonstrators.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>-Continue establishing requisite testing infrastructure to enable nuclear re-entry S&amp;T development activities and to evaluate component technologies in relevant environments.</li> <li>-Continue procurement of long-lead time special equipment for installation into government integration facilities.</li> <li>-Initiate and complete construction of integration facility for integration of strategic technologies and testbeds. Initiate significant manpower increase to support Initial Operating Capability (IOC) of government integration facility. Initiate accreditation and certification process for integration facility infrastructure, personnel, and equipment.</li> <li>-Initiate construction of radiographic facility to support imaging and evaluation for high-fidelity demonstrators.</li> <li>-Initiate procurement of long-lead time radiographic test equipment for installation into government radiographic facility.</li> <li>-Initiate and complete build and installation of high-G, high-precision centrifuge.</li> <li>-Continue the development of enhanced ground and complementary experimentation capabilities as well as the build supporting strategic-grade inertial sensor characterization and validation to meet GNC analytic activities for future flight to achieve IMU TRL 6.</li> <li>-Complete the development of a recoverable re-entry testbed supporting M&amp;S validation and component TRL maturation through interim design review. Transition testbed for enduring experimentation.</li> <li>-Complete integration planning activities for recoverable re-entry testbed and complete flight test for SPARROW IMU.</li> <li>-Continue development of enhanced ground and complementary experimentation capabilities.</li> <li>-Continue functional requirements development to establish an integration strategy and proposed test plan in relation to GNC technologies, aeroshell technologies, fuzing technologies, and telemetry for future flight.</li> <li>-Continue planning and requirements development activities for enduring GRD flights.</li> </ul>			
--	--	--	--

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603273F / <i>Science &amp; Technology for Nuclear Re-entry Systems</i>
--	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
-Initiate planning with government reference design (GRD) delivery system developer and launch facility coordinator.			
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 increased compared to FY 2024 by \$8.969 million. FY 2025 increased \$1.684 million due to the realignment of funding from Program 0603211F, Aerospace Technology Dev/Demo, Project 634094, Next Gen Platform Dev/Demo. FY 2025 decreased by \$.83 million to account for the availability of prior year execution balances. Furthermore, funding increased to account for training and manpower increases required for achieving Initial Operational Capability (IOC) of Re-Entry Vehicle Integration Laboratory (REVL) and significantly increased experimentation activities in support of GRD testbed development.			
<b>Accomplishments/Planned Programs Subtotals</b>	22.893	70.321	91.885

**D. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**E. Acquisition Strategy**

Not applicable



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603444F / <i>Maui Space Surveillance System (MSSS)</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
634868: <i>Maui Space Surveillance System</i>	-	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**  
not applicable

**A. Mission Description and Budget Item Justification**

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

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	0.000	0.002	0.000	0.000	0.000
Current President's Budget	0.000	0.002	0.000	0.000	0.000
Total Adjustments	0.000	0.000	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	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	0.000	0.000	0.000

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603444F / <i>Maui Space Surveillance System (MSSS)</i>
--	--

**Change Summary Explanation**

Not applicable

**C. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<b>Title:</b> Operate and Upgrade Maui Space Surveillance System	0.000	0.002	-
<b>Description:</b> Operate and upgrade the Maui Space Surveillance System to support development, demonstration, and integration of ground-based optical space situational awareness technologies.			
<b>FY 2024 Plans:</b> Maui Space Surveillance System operations and development/integration of related technologies.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> N/A			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.002	-

**D. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

Not Applicable

**E. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	29.250	15.593	19.568	0.000	19.568	19.849	20.252	20.903	21.341	Continuing	Continuing
635323: <i>Directed Energy Bioeffects Parameters</i>	-	6.658	7.290	6.316	0.000	6.316	4.975	4.915	5.070	5.176	Continuing	Continuing
635324: <i>Biosciences Performance Demonstration</i>	-	3.613	0.346	2.979	0.000	2.979	4.231	3.935	5.046	5.152	Continuing	Continuing
635325: <i>Mission Effective Performance</i>	-	6.284	4.134	3.922	0.000	3.922	6.177	7.470	7.683	7.844	0.000	43.514
635327: <i>Warfighter Interfaces</i>	-	12.695	3.823	6.351	0.000	6.351	4.466	3.932	3.104	3.169	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops and demonstrates technologies to enhance Airman performance and effectiveness. State-of-the-science advances are made in warfighter training, warfighter system interfaces, directed energy bioeffects, deployment and sustainment of warfighters in extreme environments, and understanding and shaping adversarial behavior. The Directed Energy Bioeffects Parameters project develops, demonstrates, and transitions technologies to predict, evaluate, and mitigate the effects of directed energy on personnel and mission performance, and exploits the offensive capabilities of directed energy systems. The Biosciences Performance Demonstration develops, demonstrates, and transitions technologies to sustain airman performance in adverse operational and/or training environments, monitor and mitigate in-flight unexplained physiological events, and prevent human performance related mishaps through real-time monitoring and mitigation—particularly through highly automated or autonomous systems. The Mission Effective Performance project develops, demonstrates, and transitions advanced training, simulation, mission rehearsal, and other performance-aiding methods and technologies to enhance warfighter readiness. The Warfighter Interfaces project develops, demonstrates, and transitions technologies to revolutionize the way airmen synergistically use Air Force systems, including autonomous machines and adaptive teams of airmen and machines. Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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 program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b>	<b>R-1 Program Element (Number/Name)</b>
3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	15.440	15.593	19.528	0.000	19.528
Current President's Budget	29.250	15.593	19.568	0.000	19.568
Total Adjustments	13.810	0.000	0.040	0.000	0.040
• 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	15.184	0.000			
• SBIR/STTR Transfer	-0.756	0.000			
• Other Adjustments	-0.618	0.000	0.040	0.000	0.040

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

		<b>FY 2023</b>	<b>FY 2024</b>
<b>Project: 635324: <i>Biosciences Performance Demonstration</i></b>			
Congressional Add: <i>Critical Air Transport Technology Demonstration</i>		0.000	-
Congressional Add Subtotals for Project: 635324		0.000	-
<b>Project: 635327: <i>Warfighter Interfaces</i></b>			
Congressional Add: <i>Automated Geospatial Intelligence Detection Algorithms</i>		5.000	0.000
Congressional Add Subtotals for Project: 635327		5.000	0.000
Congressional Add Totals for all Projects		5.000	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>				<b>Project (Number/Name)</b> 635323 / <i>Directed Energy Bioeffects Parameters</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
635323: <i>Directed Energy Bioeffects Parameters</i>	-	6.658	7.290	6.316	0.000	6.316	4.975	4.915	5.070	5.176	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops, demonstrates, and transitions technologies to predict, evaluate, and mitigate the effects of novel weapon systems on personnel and mission performance, and exploits the offensive capabilities of directed energy systems. This project develops the human components of the guidelines for testing, deployment, and protection from high-power microwave and high-energy laser systems and uses this information to inform design and enhance the effectiveness of these weapon systems in air, space, and cyber operations. This project develops tools and plug-ins that enhance mission and engagement models, provide predictive risk analysis for deployment of Directed Energy systems, and analyzes systems for use. This project develops tools and analysis techniques for counter directed energy weapon technologies. The effort also develops modeling and simulation tools to unite bioeffects and human performance models from across the Department of the Air Force in support of Digital Transformation initiatives.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Directed Energy Bioeffects	6.658	7.290	6.316
<b>Description:</b> This project combines two efforts into a single effort to better align the directed energy modeling simulation and analysis supporting both radio-frequency and laser bioeffects advanced demonstration. Develop and demonstrate modeling capabilities to assess collateral hazards from high power directed energy systems, including the use of probabilistic risk assessment techniques and analysis of system-level effects on the Airman. Develop and demonstrate counter directed energy weapons technologies for aircrew and ground personnel to provide protection against directed energy threats. United bioeffects and human performance models from across the Department of the Air Force in support of Digital Transformation initiatives.			
<b>FY 2024 Plans:</b> Continue to provide hazard analysis for directed energy and novel weapon systems under development. Continue maturation of high peak power radio frequency and laser human effects assessment models and tools to address real world concerns. Provide human based design requirements optimizing operational and mission performance for counter directed energy weapon technologies. Continue integration of radio frequency and optical radiation hazards and behavioral analysis into engagement-level modeling, simulation, and analysis tools for future transitions in mission-level tool suites to support formal studies and analyses. Continue development of integrated vision modeling libraries to optimize agile laser eye protection technologies. Integrate modeling and simulation capabilities into existing architectures for weaponeering and mission level analyses to enable holistic human performance modeling.			
<b>FY 2025 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	<b>Project (Number/Name)</b> 635323 / <i>Directed Energy Bioeffects Parameters</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue to provide hazard analysis for directed energy and novel weapon systems under development, demonstrating new validated capabilities for personnel hazard assessments.</li> <li>- Continue to demonstrate and integrate high peak power radio frequency and laser human effects assessment models and tools to address real world concerns.</li> <li>- Continue to provide human-based design requirements optimizing operational and mission performance for counter-directed energy weapon technologies.</li> <li>- Continue the integration of radio frequency and optical radiation hazards and behavioral analysis into engagement-level modeling, simulation, and analysis tools for future transitions in mission-level tool suites to support formal studies and analyses.</li> <li>- Continue development of integrated vision modeling libraries to optimize agile laser eye protection technologies. Integrate modeling and simulation capabilities into existing architectures for weaponeering and mission level analyses to enable holistic human performance modeling.</li> <li>- Continue Agile Laser Eye Protection analysis tool to develop and deliver an integrated modeling environment for optimizing devices for protecting eyes against optical radiation and mitigating the visual impact of those devices on airman interfaces, visual performance &amp; operational effectiveness.</li> <li>- Complete directed energy human effects modules for wargaming scenarios and weaponeering tools.</li> <li>- Initiate Virtual Reality component for vision effects (Glare/Dazzle) through transition of laser dazzle simulations into operational applications.</li> <li>- Initiate development of library of Model-based Systems Engineering and constructive modules for building human digital twins and vulnerability models for host simulation environments, mission level models and wargame toolsets.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 decreased compared to FY 2024 by \$0.974 million. Funding decrease due to reduced emphasis in directed energy human effects modules for wargaming scenarios and weaponeering tools.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	6.658	7.290	6.316

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>				<b>Project (Number/Name)</b> 635324 / <i>Biosciences Performance Demonstration</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
635324: <i>Biosciences Performance Demonstration</i>	-	3.613	0.346	2.979	0.000	2.979	4.231	3.935	5.046	5.152	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

Project objective is to develop, demonstrate, and transition products that provide Airman-integrated capabilities to sustain, enhance, and augment airmen physical and cognitive performance under challenging and adverse operational and training mission environments. Integrate technical advances in molecular and synthetic biology, multi-omics, cognitive performance optimization, brain-machine interface, and application of non-invasive physiological and cognitive performance monitoring devices. Develop solutions to sense, assess, and mitigate impacts to airmen performance degradation including, but not limited to, unexplained physiological events, fatigue, injury, stressors (i.e. environmental, occupational, personal), and cognitive overload. Develop technologies to enhance and accelerate individual physical and cognitive ability to rapidly learn and acquire new mission skills and maintain proficiency of acquired skills. Develop technologies providing commanders real time status monitoring and assessment of individual's mission ready status and intervention protocols to accelerate restoral to combat readiness.

In FY 2025 Project 635324, Biosciences Performance Demonstration, changed from Human Dynamics and Terrain Demonstration.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Sensing and Assessment	1.941	0.000	0.000
<b>Description:</b> Develop advanced systems integrating biological, physiological, neural, environmental, and behavioral sensing capabilities with validated analytics and assessments to sustain and enhance Airman performance. Resulting products fall within three operational mission environments: (1) maintenance, (2) special operations/dismount forces, and (3) aircrew (cockpit). Emphasis is on maturing and transitioning platform integrated technologies that provide operator mission-specific performance sustainment and enhancement.			
<b>FY 2024 Plans:</b> There are no planned FY 2024 activities for the Sensing and Assessment Project. The project will complete all planned activities by end of FY 2023 and close out.			
<b>FY 2025 Plans:</b> Not Applicable			
<b>Title:</b> Human Performance Augmentation and Development	1.672	0.346	2.979
<b>Description:</b> Develop and demonstrate advanced prototype products that provide Air-integrated capabilities to provide decision advantage and enable Airman performance under cognitive and physiological stressors associated with prolonged, high tempo,			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	<b>Project (Number/Name)</b> 635324 / <i>Biosciences Performance Demonstration</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
and demanding mission scenarios as well as stressors associated with operations in adverse environments (i.e. high altitude, Arctic). Provide capabilities to assess in real-time the physical and cognitive state of operators and provide feedback and intervention capabilities to restore and enhance operator performance.			
<p><b>FY 2024 Plans:</b> Continue system development of a fatigue management system, Fatigue Optimized Cognition Under Stress (FOCUS). Integrate the FOCUS mobile device app with sensors monitoring both physical/cognitive biometrics and molecular biomarkers indicative of fatigue. Develop and fine tune models/algorithms utilizing the sensor data and self-assessment inputs to provide real-time feedback and intervention protocols to sustain and optimize cognitive performance per mission needs. Initiate testing, evaluation, and validation of a recommended caffeine dosing algorithm. Initiate initial field testing of the Gen 1 FOCUS app, integrated sensors, and data analytics. Complete interstitial fluid sensing analysis of operational and mission stressors.</p> <p><b>FY 2025 Plans:</b> - Continue system development of a fatigue management system, Fatigue Optimized Cognition Under Stress. - Continue to refine the eye tracking-based fatigue assessment algorithm. - Continue integrating eye tracking-based fatigue assessment algorithm with the mobile/console mission application software. - Continue development of a secure, cloud-based data managements system to collect and analyze in-flight human performance physiologic data. - Initiate lab validation study of an initial eye tracking fatigue algorithm and a non-invasive form of neuromodulation, transcutaneous vagal nerve stimulation, as a counter-measure intervention for fatigue symptoms.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$2.633 million. Funding increase due to added emphasis in fatigue and cognitive monitoring and counter-measure fatigue interventions.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	3.613	0.346	2.979

	<b>FY 2023</b>	<b>FY 2024</b>
<b>Congressional Add:</b> Critical Air Transport Technology Demonstration	0.000	-
<b>FY 2023 Accomplishments:</b> Congressionally directed effort (Critical Air Transport Technology Expansion) was moved from PE 0602202F / Human Effectiveness Applied Research, BPAC 625328 Biosciences Performance for execution.		
<b>Congressional Adds Subtotals</b>	0.000	-



UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / Human Effectiveness Advanced Technology Development	Project (Number/Name) 635324 / Biosciences Performance Demonstration

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>				<b>Project (Number/Name)</b> 635325 / <i>Mission Effective Performance</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
635325: <i>Mission Effective Performance</i>	-	6.284	4.134	3.922	0.000	3.922	6.177	7.470	7.683	7.844	0.000	43.514
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops, demonstrates, and transitions advanced training, simulation, mission rehearsal, and other performance-aiding methods and technologies to enhance warfighter readiness. This project also develops advanced methods and technologies to enable interactive Live-Virtual-Constructive blended environments for performance-aiding methods and technologies. Focus areas include integrated high-fidelity weapon systems training technologies for air, space, and cyber; tailored immersive simulation environments for airmen at the tactical and operational levels; and incorporation of performance assessment and feedback tools. These methods and technologies facilitate the development of mission-essential competencies.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Readiness	6.284	4.134	3.922
<b>Description:</b> Develop and demonstrate a secure, persistent, and standardized blended live-virtual-constructive operational test and training enterprise. Utilize modeling capabilities for technology demonstration efforts focused on developing software-based tools for managing training, tracking proficiency and readiness, and for training that would replace the human as adversaries and instructors.			
<b>FY 2024 Plans:</b> Continue using encrypted data specifications as part of the migration and integration of those data into an operational readiness data with user-specified data extraction and reporting formats. Continue integration of readiness measurement tools in all current training and readiness environments, to include augmented and virtual reality, part-task, full fidelity simulators, the Joint Simulation Environment, and operational range infrastructure. Continue conducting evaluations of higher fidelity software agent models integrated with live and virtual systems and their impact on the quality of training and exercise for a peer fight. Continue work to integrate, evaluate and demonstrate technologies to support multi-capable airmen with just-in-time-training and readiness support in deployed and austere mission contexts and locations. Initiate work integrating training management and data tracking tools and interfaces into the Synthetic Operational Test and Training Infrastructure. Continue field evaluations connecting big data and proficiency-based training infrastructure with operational event-based tracking and reporting systems. Continue systematic evaluations of proficiency-based live-virtual-constructive on operational readiness and more optimal mixes of live and virtual training and exercise. Initiate demonstrations of secure fighter integration blended training events in both research and operational locations, including The Five Eyes coalition partner venues. Initiate work to integrate Distributed Mission operations-and Joint			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	<b>Project (Number/Name)</b> 635325 / <i>Mission Effective Performance</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Simulation Environment-based architectures to support interoperable, peer-level training and rehearsal across 4th, 5th, and beyond generation mission sets.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Complete using encrypted data specifications as part of the migration and integration of those data into an operational readiness data with user-specified data extraction and reporting formats.</li> <li>- Complete integration of readiness measurement tools in all current training and readiness environments, to include augmented and virtual reality, part-task, full fidelity simulators, the Joint Simulation Environment, and operational range infrastructure.</li> <li>- Complete evaluations of higher fidelity software agent models integrated with live and virtual systems and their impact on the quality of training and exercise for a peer fight.</li> <li>- Continue work to integrate, evaluate, and demonstrate technologies to support multi-capable airmen with just-in-time-training and readiness support in deployed and austere mission contexts and locations.</li> <li>- Continue work integrating training management and data tracking tools and interfaces into the Synthetic Operational Test and Training Infrastructure. Continue field evaluations connecting big data and proficiency-based training infrastructure with operational event-based tracking and reporting systems.</li> <li>- Continue systematic evaluations of proficiency-based live-virtual-constructive on operational readiness and more optimal mixes of live and virtual training and exercise. Initiate demonstrations of secure fighter integration blended training events in both research and operational locations, including The Five Eyes coalition partner venues.</li> <li>- Continue work to integrate Distributed Mission operations-and Joint Simulation Environment-based architectures to support interoperable, peer-level training and rehearsal across 4th, 5th, and beyond generation mission sets.</li> <li>- Initiate Modeling and Simulation Integration Lab innovation integration work supporting the Effects Based Simulator and Joint Simulation Environment advancements.</li> <li>- Initiate Effects Based Simulator and Joint Simulation Environment integration and interoperability development supporting Synthetic Operational Test and Training for Command, Control, Communications and Battle Management.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$0.212 million. Funding decrease due to reduced emphasis in readiness measurement tools for training and readiness environments.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	6.284	4.134	3.922

<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A
<b>Remarks</b>

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603456F / Human Effectiveness Advanced Technology Development	Project (Number/Name) 635325 / Mission Effective Performance

**D. Acquisition Strategy**  
Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>				<b>Project (Number/Name)</b> 635327 / <i>Warfighter Interfaces</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
635327: <i>Warfighter Interfaces</i>	-	12.695	3.823	6.351	0.000	6.351	4.466	3.932	3.104	3.169	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops, demonstrates, and readies the transition of technologies to revolutionize the way airmen optimize the capabilities of Air Force systems, including autonomous machines and adaptive teams of Airmen and machines. Improvements in the presentation of operational information to the community of users, from the system operator to the commander, must be developed in step with advancements in the acquisition, storage, and retrieval of information. This project provides the advances in understanding of human cognitive abilities, as well as the utilization of human interfaces, multisensory fusion, high-resolution image displays, and three-dimensional audio to customize communications and enhance shared understanding across a diverse user community in air, space, and cyber for maximum situational awareness.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Airman Machine Interfaces	2.645	1.338	6.351
<p><b>Description:</b> Develops advanced, situationally-adaptive and scalable interface technology and decision aiding tools for more rapid and accurate battlefield awareness, decision making and maximized collaborative, distributed human-machine team performance. This is accomplished through integrated solutions that manage Airman cognitive workload in complex, distributed, and degraded environments.</p> <p><b>FY 2024 Plans:</b> Continue advanced command and control (C2) technologies for operators in multiple domains (to include cyber and space domains), as well as enabling Air Battle Management System capabilities for distributed C2. Continue expanding the library of user interfaces for Autonomous Collaborative Enabling Technologies, and initiate multiple autonomous behaviors developed by Defense Advanced Research Projects Agency and the Air Force Strategic Development Planning and Experimentation in order to meet demands of strategic, operational and tactical environments for manned-unmanned teaming. Continue development of collaborative interfaces, leveraging intelligent agents and autonomy for cognitive workload reduction, and optimization of distributed human-human and human-machine teaming. Continue the transition of open and interoperable software to Air Battle Management System-supported platforms. Continue the transition of interface technologies and battle management C2 systems for base defense and protection of the tactical airspace from small unmanned aerial systems. Complete wearable communication management system prototypes for mission recording and intelligibility enhancement. Continue automation of mission planning and debrief for assets with unique capabilities and include intelligent agent aided decision making. Initiate the development</p>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	<b>Project (Number/Name)</b> 635327 / <i>Warfighter Interfaces</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>of mission planning for Intelligence, Surveillance, Reconnaissance optimization and battle damage assessment. Initiate the enhancement of map drawing capabilities for mission planning and debrief.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue advanced command and control technologies for operators in multiple domains, as well as enabling Air Battle Management System capabilities for distributed command and control.</li> <li>- Continue expanding the library of user interfaces for Autonomous Collaborative Enabling Technologies, and initiate multiple autonomous behaviors developed by Defense Advanced Research Projects Agency and the Air Force Strategic Development Planning and Experimentation in order to meet demands of strategic, operational, and tactical environments for manned-unmanned teaming.</li> <li>- Continue development of collaborative interfaces, leveraging intelligent agents and autonomy for cognitive workload reduction, and optimization of distributed human-human and human-machine teaming.</li> <li>- Continue the transition of open and interoperable software to Air Battle Management System-supported platforms.</li> <li>- Complete the transition of interface technologies and battle management command and control systems for base defense and protection of the tactical airspace from small unmanned aerial systems.</li> <li>- Continue automation of mission planning and debrief for assets with unique capabilities and include intelligent agent aided decision making.</li> <li>- Continue the development of mission planning for Intelligence, Surveillance, Reconnaissance optimization and battle damage assessment.</li> <li>- Complete the enhancement of map drawing capabilities for mission planning and debrief.</li> <li>- Initiate human-machine teaming development and integration with mission planning and debrief for Collaborative Combat Aircraft.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$5.013 million. Funding increase due to added emphasis in command and control technologies and human-machine teaming integration with mission planning and debriefing.</p>				
<p><b>Title:</b> Analytic Tools</p> <p><b>Description:</b> Develop, demonstrate, and transition software and hardware tools that help conventional Department of Defense, Special Operations, and Intelligence customers to rapidly identify, analyze, shape, and operationalize all types of information without succumbing to "analysis paralysis." In addition to delivering stand-alone tools, supports other Air Force Research Laboratory Technical Directorates. Build human-centric training solutions to: triage data-at-scale, automate mundane processes, optimize workflow, identify obscured patterns, mitigate cognitive overload, expedite logical decision-making, quantify performance metrics, accelerate human interpretation of information, and autonomously cue humans in live-virtual-constructive environments. These tools mitigate the scale and complexity in Joint All Domain Operations environments.</p>		5.050	2.485	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	<b>Project (Number/Name)</b> 635327 / <i>Warfighter Interfaces</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b><i>FY 2024 Plans:</i></b> Continue in-house Live-Virtual-Constructive simulation architecture to address training deficiencies across the Department of the Air Force. Initiate the integration of augmented reality, virtual reality, and mixed reality tools into Live-Virtual-Constructive environments, improving upon the current simulation ecosystems. Complete automation and real-time feedback of single simulator environments, and proactive cueing in multisimulator, team environments. Continue expansion of in-house Live-Virtual-Constructive simulation architecture to include the Space, Cyber, and/or Maritime domains. Continue the production and maturation of software to operationalize existing, in-house Live-Virtual-Constructive architecture, to include autonomy-enabled intelligence, Surveillance, and Reconnaissance applications. Initiate integration of data analysis tools into the emerging Synthetic Operational Test and Training Infrastructure, with emphasis on software that detect patterns in: friend/enemy verbal communications, multi-sensor data extraction/correlation, and automated cueing for complex, high-stress, and/or time-sensitive tasks. Continue Artificial Intelligence/Machine Learning analytic tools from "canned" frameworks to explainable architectures and interfaces that leverage the psychology of human trust. Initiate object-based Graphical User Interfaces that are highly customizable by military users with limited software skills.</p> <p><b><i>FY 2025 Plans:</i></b> There are no planned FY 2025 activities for the Analytic Tools Project. The project will complete all planned activities by end of FY 2024 and close out.</p> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 decreased compared to FY 2024 by \$2.485 million. Funding decrease due to a reduced emphasis in analytic tools efforts, and the close out and completion of all planned activities by end of FY 2024.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	7.695	3.823	6.351

	<b>FY 2023</b>	<b>FY 2024</b>
<b><i>Congressional Add:</i></b> Automated Geospatial Intelligence Detection Algorithms	5.000	0.000
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressionally directed efforts		
<b><i>FY 2024 Plans:</i></b> Not applicable		
<b>Congressional Adds Subtotals</b>	5.000	0.000

<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A
<b>Remarks</b>

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603456F / <i>Human Effectiveness Advanced Technology Development</i>	<b>Project (Number/Name)</b> 635327 / <i>Warfighter Interfaces</i>

**D. Acquisition Strategy**  
Not applicable



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	144.026	132.311	125.460	0.000	125.460	99.728	115.143	121.100	120.674	Continuing	Continuing
63670A: <i>Weapon Technology Development</i>	-	52.693	68.027	73.669	0.000	73.669	55.738	72.897	80.575	79.302	Continuing	Continuing
63670B: <i>Weapon Concept Development</i>	-	91.333	64.284	51.791	0.000	51.791	43.990	42.246	40.525	41.372	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops, integrates, and demonstrates advanced ordnance and guidance technologies for conventional weapons. The effort focuses on conventional ordnance component technologies such as warheads, fuzes, and explosives, as well as munition guidance component technologies such as navigation and control systems and seekers. Technologies to be developed, demonstrated, and integrated into system concepts will address blast, fragmentation, penetration, low collateral damage, variable depth/location fuzing, precise guidance, and high-performance and insensitive explosives. Efforts in this project have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of such program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602605F, 0602788F, 0602298F, and 0602020F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>
--	--

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	154.618	132.311	136.709	0.000	136.709
Current President's Budget	144.026	132.311	125.460	0.000	125.460
Total Adjustments	-10.592	0.000	-11.249	0.000	-11.249
• 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	-4.867	0.000			
• Other Adjustments	-5.725	0.000	-11.249	0.000	-11.249

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 63670B: *Weapon Concept Development*

Congressional Add: *Next generation affordable direct attack munition*

Congressional Add Subtotals for Project: 63670B

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	9.685	-
	9.685	-
	9.685	-

**Change Summary Explanation**

FY 2025 funding request was reduced by \$5.211 million to account for the availability of prior year execution balances.

FY 2025 funding request was reduced by \$6.290 million due to Air Force funding re-prioritization.

FY 2025 funding request was increased \$0.252 million due to inflation rates for Non-pay and non-fuel purchases

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>				<b>Project (Number/Name)</b> 63670A / <i>Weapon Technology Development</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
63670A: <i>Weapon Technology Development</i>	-	52.693	68.027	73.669	0.000	73.669	55.738	72.897	80.575	79.302	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops, matures, assesses, and demonstrates advanced/innovative ordnance and guidance component and subsystem technologies for conventional weapons. The project focuses on maturation of advanced explosives, fuzes, warheads, sub-munitions, and weapon airframes, carriage and dispensing; as well as innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Ordnance Technologies	25.816	32.626	35.332
<b>Description:</b> Develop and demonstrate integrated ordnance technologies to improve conventional munitions. Specific technical areas of focus include energetic materials, fuze technology, warhead sciences, and modeling and simulation tools.			
<b>FY 2024 Plans:</b> Continue demonstrating and assessing advanced distributed, embedded fuzing concepts for long-term safety, survivability, and functionality. Continue advanced development of ordnance technologies to allow tailored lethality by controlling weapon fragmentation. Continue maturation of advanced ordnance technologies for rapid transition into high-speed strike weapon concepts, collecting complex arena test data for implementation into lethality modeling and simulation tools. Continue developing test capabilities and high-fidelity analysis tools to quickly generate more accurate weaponing data. Continue developing advanced ordnance technologies for high-speed impact. Continue developing advanced ordnance technologies/methodologies for functional defeat. Continue research into armament systems for Special Operations applications. Continue conducting lethality analyses for weapons and lethality/survivability tools at the meso/micro-scale. Continue the development of high-fidelity test capabilities and analysis tools to evaluate ordnance technologies in relevant environments. Continue incorporation of previously developed material models and improve/advance additional joint kinetic/directed energy common target models. Continue synthesis and incorporation of warhead models for progressive collapse, multiple point initiation, secondary debris and other models to include those supportive of coordinated and distributed impact.			
<b>FY 2025 Plans:</b> - Continue demonstrating and assessing advanced distributed, embedded fuzing concepts for long-term safety, survivability, and functionality. - Continue advanced development of ordnance technologies to allow tailored lethality by controlling weapon fragmentation.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>	<b>Project (Number/Name)</b> 63670A / <i>Weapon Technology Development</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue maturation of advanced ordnance technologies for rapid transition into high-speed strike weapon concepts, collecting complex arena test data for implementation into lethality modeling and simulation tools.</li> <li>- Continue developing test capabilities and high-fidelity analysis tools to quickly generate more accurate weaponeering data.</li> <li>- Continue developing advanced ordnance technologies for high-speed impact.</li> <li>- Continue developing advanced ordnance technologies/methodologies for functional defeat.</li> <li>- Complete research into armament systems for Special Operations applications.</li> <li>- Continue conducting lethality analyses for weapons and lethality/survivability tools at the meso/micro-scale.</li> <li>- Continue the development of high-fidelity test capabilities and analysis tools to evaluate ordnance technologies in relevant environments.</li> <li>- Continue incorporation of previously developed material models and improve/advance additional joint kinetic/directed energy common target models.</li> <li>- Continue synthesis and incorporation of warhead models for progressive collapse, multiple point initiation, secondary debris, and other models to include those supportive of coordinated and distributed impact.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$2.706 million due to increased emphasis on advanced technology development in high-speed ordnance technology and ordnance technologies versus maritime targets.</p>			
<p><b>Title:</b> Guidance Technologies</p> <p><b>Description:</b> Develop guidance technologies to improve the precision, controlled lethality, and flexibility of conventional munitions. Specific technical areas include precision navigation and terminal seekers.</p> <p><b>FY 2024 Plans:</b> Continue integration of hardware-in-the-loop, software-in-the-loop, and other modeling and simulation technologies for the demonstration of open architecture, high-speed, networked, collaborative and autonomous, and modular munition concepts. Complete the design, development, and evaluation of seeker sub-system prototypes for platform self-defense and initiate investigation of alternative applications. Continue development of advanced, high-resolution infrared scene projectors, distributed simulation concepts, software-defined radio frequency test chamber, scene generation, mission, engagement, campaign level simulations, and panoramic infrared dome technologies. Continue to develop technologies for precision navigation of weapons in Global Positioning System-denied scenarios. Continue to mature and integrate advanced carriage and release concepts and sub-systems. Continue improving multi-security level, cross-domain distributed modeling and simulation for munition research using distributed connectivity between Eglin Air Force Base facilities and other geographic locations. Continue integrating higher-fidelity lethality models into guidance and control simulations to enhance weapon integrated performance. Continue integrating higher fidelity constructive analysis tools with engagement and mission level modeling and simulation. Complete miniature munition</p>	26.877	35.401	38.337

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>	<b>Project (Number/Name)</b> 63670A / <i>Weapon Technology Development</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>technology integration for ground launch demonstration. Continue design and development of a weapons digital ecosystem that enables digital engineering and the use of high-fidelity digital twinning across the weapons lifecycle.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue integration of hardware-in-the-loop, software-in-the-loop, and other modeling and simulation technologies for the demonstration of open architecture, high-speed, networked, collaborative and autonomous, and modular munition concepts.</li> <li>- Complete investigation of alternative applications for seeker sub-system prototypes originally developed for platform self-protection.</li> <li>- Continue development of advanced, high-resolution infrared scene projectors, distributed simulation concepts, software-defined radio frequency test chamber, scene generation, mission, engagement, campaign level simulations, and panoramic infrared dome technologies.</li> <li>- Continue to develop technologies for precision navigation of weapons in Global Positioning System-denied scenarios.</li> <li>- Continue to mature and integrate advanced carriage and release concepts and sub-systems.</li> <li>- Continue improving multi-security level, cross-domain distributed modeling and simulation for munition research using distributed connectivity between Eglin Air Force Base facilities and other geographic locations.</li> <li>- Continue integrating higher-fidelity lethality models into guidance and control simulations to enhance weapon integrated performance.</li> <li>- Continue integrating higher fidelity constructive analysis tools with engagement and mission level modeling and simulation.</li> <li>- Continue design and development of a weapons digital ecosystem that enables digital engineering and the use of high-fidelity digital twinning across the weapons lifecycle.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 increased compared to FY 2024 by \$2.936 million due to the acceleration of digital demonstrations of open architecture, high-speed, networked, collaborative and autonomous (NCA), and modular munition concepts within a weapons digital ecosystem.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	52.693	68.027	73.669

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>				<b>Project (Number/Name)</b> 63670B / <i>Weapon Concept Development</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
63670B: <i>Weapon Concept Development</i>	-	91.333	64.284	51.791	0.000	51.791	43.990	42.246	40.525	41.372	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops, refines, integrates, demonstrates, and assesses ordnance and guidance technologies to reduce risk for potential conventional weapons acquisitions. The project concentrates in two effort areas, Air-to-Air Concept Development and Air-to-Ground Concept Development. The project focuses on risk reduction of advanced explosives, fuzes, warheads, sub-munitions, and weapon airframes, carriage and dispensing; as well as innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Air-to-Air Concept Development	39.519	30.585	24.641
<b>Description:</b> Mature, integrate, and demonstrate air-to-air weapon components and systems to include ordnance, guidance, and carriage and release technologies to demonstrate war-fighter capability.			
<b>FY 2024 Plans:</b> Continue developing the technology trade space to enable air-to-air weapons with robust capability in the future threat environment, including technologies for efficient propulsion, high lethality, efficient flight, high agility, miniaturization, as well as cost and risk reduction for both offensive and defensive purposes. Continue developing and testing propulsion systems with flexibility to enable more adaptable next generation air-to-air weapons. Continue conducting lethality analysis to enable design of small form factor warheads for lethality against the 2030-plus target set. Continue transitioning advanced target models to other AF and DoD offices. Continue developing preliminary design of air-to-air weapon concepts for sixth-generation platforms. Continue exploring and documenting missile flight dynamics trade space. Continue conducting wind-tunnel experiments to characterize airframes and validate aerodynamic codes leading to development of highly maneuverable and efficient missiles to counter advanced targets, and improve persistence and survivability of future platforms. Continue conducting ground and arena tests of advanced weapons experimental carriages for sixth-generation weapon concept and prepare for flight worthiness testing. Continue performing experiments with small warheads to obtain data for lethality analysis to validate and improve designs. Continue planning and executing integrated sub-system experiments. Continue modeling, simulation, analysis, and digital engineering in support of air-to-air advanced weapon technologies.			
<b>FY 2025 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>	<b>Project (Number/Name)</b> 63670B / <i>Weapon Concept Development</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue developing the technology trade space to enable air-to-air weapons with robust capability in the future threat environment, including technologies for efficient propulsion, long-range, high lethality, efficient flight, high agility, miniaturization, as well as cost and risk reduction for both offensive and defensive purposes.</li> <li>- Continue developing and testing propulsion systems with flexibility to enable more adaptable next generation air-to-air weapons.</li> <li>- Continue conducting lethality analysis to enable design of small form factor warheads for lethality against the 2030-plus target set.</li> <li>- Continue transitioning advanced target models to other AF and DoD offices.</li> <li>- Continue developing preliminary design of air-to-air weapon concepts for sixth- generation platforms.</li> <li>- Continue exploring and documenting missile flight dynamics trade space.</li> <li>- Continue conducting wind-tunnel experiments to characterize airframes and validate aerodynamic codes leading to development of highly maneuverable and efficient missiles to counter advanced targets and improve persistence and survivability of future platforms.</li> <li>- Continue conducting ground and arena tests of advanced weapons experimental carriages for sixth-generation weapon concept and prepare for flight worthiness testing.</li> <li>- Continue performing experiments with small warheads to obtain data for lethality analysis to validate and improve designs.</li> <li>- Continue planning and executing integrated sub-system experiments.</li> <li>- Continue modeling, simulation, analysis, and digital engineering in support of air-to-air advanced weapon technologies.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$5.944 million due to reduced scope of efforts associated with system-level integration and concept demonstration of technical components/subsystems in deference to higher Air Force priorities.</p>			
<p><b>Title:</b> Air-to-Ground Concept Development</p> <p><b>Description:</b> Mature, integrate, and demonstrate air-to-ground weapon components and systems (ordnance, guidance, and carriage and release technologies) to demonstrate war-fighter capability.</p> <p><b>FY 2024 Plans:</b> Continue technology risk reduction including demonstration and flight testing for weapons concepts responsive to the future threat environment (including hypersonic and high-speed concepts). Initiate technology risk reduction for hypersonic and high-speed weapon concepts development within a scalable, cloud-enabled modeling and simulation ecosystem. Continue developing kinetic/ non-kinetic payloads, seeker, and fuze technology for hypersonic applications. Continue modeling, simulation, analysis, and digital engineering in support of air-to-ground advanced weapon technologies.</p> <p><b>FY 2025 Plans:</b></p>	42.129	33.699	27.150

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603601F / <i>Conventional Weapons Technology</i>	<b>Project (Number/Name)</b> 63670B / <i>Weapon Concept Development</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Continue technology risk reduction including demonstration and flight testing for weapons concepts responsive to the future threat environment (including hypersonic and high-speed concepts).</li> <li>- Continue technology risk reduction for hypersonic and high-speed weapon concepts development within a scalable, cloud-enabled modeling and simulation ecosystem.</li> <li>- Continue developing kinetic payloads, seeker, and fuze technology for hypersonic and high-speed applications.</li> <li>- Continue modeling, simulation, analysis, and digital engineering in support of air-to-ground advanced weapon technologies.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b>  FY 2025 decreased compared to FY 2024 by \$6.549 million due to reduced scope of efforts associated with system-level integration and concept demonstration of technical components/subsystems in deference to higher Air Force priorities.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	81.648	64.284	51.791

	<b>FY 2023</b>	<b>FY 2024</b>
<b><i>Congressional Add:</i></b> Next generation affordable direct attack munition	9.685	-
<b><i>FY 2023 Accomplishments:</i></b> Conduct Congressionally-directed efforts.		
<b>Congressional Adds Subtotals</b>	9.685	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable.



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603605F / <i>Advanced Weapons Technology</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	81.040	102.997	25.050	0.000	25.050	4.935	21.159	22.526	22.902	Continuing	Continuing
633151: <i>High Power Solid State Laser Technology</i>	-	28.585	15.849	0.000	0.000	0.000	0.000	13.520	14.104	9.390	Continuing	Continuing
633152: <i>High Power Microwave Development and Integration</i>	-	52.455	87.148	25.050	0.000	25.050	4.935	7.639	8.422	13.512	0.000	199.161

**A. Mission Description and Budget Item Justification**

This program provides for the development, integration, demonstration, and detailed assessment of directed energy (DE) weapon technologies for potential application on Air Force platforms. These include high energy laser (HEL), high power microwaves (HPM), and other unconventional weapon generation and transmission technologies, which can support a wide range of Air Force applications. The program develops a corresponding susceptibility, vulnerability, and lethality database for directed energy weapons. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

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 program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force** **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603605F / <i>Advanced Weapons Technology</i>
--	--

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	89.024	102.997	52.172	0.000	52.172
Current President's Budget	81.040	102.997	25.050	0.000	25.050
Total Adjustments	-7.984	0.000	-27.122	0.000	-27.122
• 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	-1.096	0.000			
• SBIR/STTR Transfer	-3.164	0.000			
• Other Adjustments	-3.724	0.000	-27.122	0.000	-27.122

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 633151: *High Power Solid State Laser Technology*

Congressional Add: *Program increase - LIDAR CUAS automated target recognition*

Congressional Add Subtotals for Project: 633151

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	5.000	-
	5.000	-
	5.000	-

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603605F / <i>Advanced Weapons Technology</i>	<b>Project (Number/Name)</b> 633151 / <i>High Power Solid State Laser Technology</i>
--	--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
633151: <i>High Power Solid State Laser Technology</i>	-	28.585	15.849	0.000	0.000	0.000	0.000	13.520	14.104	9.390	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project provides for the development, integration, demonstration, and detailed technical assessment of high energy laser devices, advanced imaging, and beam control technologies needed for applications such as force protection, force application, precision engagement, and aircraft protection. Laser system concept assessments to include vulnerability assessments and target effect testing are performed.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2023	FY 2024	FY 2025
<b>Title:</b> High Energy Laser/Beam Control	23.585	15.849	0.000
<b>Description:</b> Develop and demonstrate advanced beam control technologies, integrated laser systems, and aircraft protection laser technologies. Demonstrate beam control components integrated with high energy lasers for the Department of the Air Force utility.			
<b>FY 2024 Plans:</b> Continue additional testing and demonstration activities with packaged high energy laser (HEL) and/or beam control subsystem. Continue laser subsystems integration for a ground demonstration. Initiate next phase of advanced integrated technologies for compact, low-size, weight and power (SWaP) airborne laser weapon system.			
<b>FY 2025 Plans:</b> - Reduce testing and demonstration of the Packaged HEL and beam control subsystem, supported by in-house government personnel only. - Terminate laser subsystems integration for a ground demonstration. - Reduce planning for next phase of advanced integrated technologies for compact, low-size, weight and power (SWaP) airborne laser weapon system, supported by in-house government personnel only.			
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$15.849 million due to re-prioritization to meet the nation's future security needs.			
<b>Accomplishments/Planned Programs Subtotals</b>	23.585	15.849	0.000

**UNCLASSIFIED**

**Exhibit R-2A, RDT&E Project Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603605F / <i>Advanced Weapons Technology</i>	<b>Project (Number/Name)</b> 633151 / <i>High Power Solid State Laser Technology</i>
--	--	---

	FY 2023	FY 2024
<b>Congressional Add:</b> Program increase - LIDAR CUAS automated target recognition	5.000	-
<b>FY 2023 Accomplishments:</b> Conduct Congressional directed efforts.		
<b>Congressional Adds Subtotals</b>	5.000	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A  
**Remarks**  
Not Applicable

**D. Acquisition Strategy**

Not Applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603605F / <i>Advanced Weapons Technology</i>				<b>Project (Number/Name)</b> 633152 / <i>High Power Microwave Development and Integration</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
633152: <i>High Power Microwave Development and Integration</i>	-	52.455	87.148	25.050	0.000	25.050	4.935	7.639	8.422	13.512	0.000	199.161
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This project develops and demonstrates high power microwave and other unconventional electromagnetic field generation and transmission technologies that can be integrated into future weapon systems to support a wide range of the Department of the Air Force missions such as air base defense or the damage/destruction of an adversary's electronic infrastructure. It also provides inputs to the susceptibility, vulnerability, and lethality databases used across the Department of Defense to understand thresholds for scalable effects of directed energy weapons.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> High Power Microwave Technologies	52.455	87.148	25.050
<b>Description:</b> Develop and evaluate high power microwave and other unconventional weapon technologies for various platforms, including aerial, for applications such as counter-electronics. Develop and evaluate high power microwave technologies for non-kinetic and counter-electronic weapon applications.			
<b>FY 2024 Plans:</b> Continue development of high power microwave components to enable the integration into aerial platforms, ground-based systems and mobile systems. Initiate development of a high power microwave system for an integrated air and missile defense mission. Continue development of modeling tools and test capabilities to evaluate current and projected blue Directed Energy weapons against relevant red assets. Continue development of next generation high power microwave high frequency sources. Continue a high-priority base defense mission with joint high power microwave system with the Military Services for Directed Energy Frontline Electromagnetic Neutralization and Defeat (DEFEND).			
<b>FY 2025 Plans:</b> - Terminate the development of high power microwave components to enable the integration into aerial platforms, ground-based systems, and mobile systems; focus on technologies that can decrease the size and weight of systems while still providing the same capability. - Terminate the development of modeling tools and test capabilities to evaluate current and projected blue directed energy weapons against relevant red assets. - Initiate in-house government exploration of novel methods to increase power; focus on reducing the logistical requirements and maintenance requirements of the sources. - Terminate development of next generation high power microwave high frequency sources.			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603605F / <i>Advanced Weapons Technology</i>	<b>Project (Number/Name)</b> 633152 / <i>High Power Microwave Development and Integration</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Terminate development of a high power microwave system for an integrated air and missile defense mission; focus on technologies that would allow the system to be compliant with agile combat employment.</li> <li>- Continue a high-priority base defense mission with joint high power microwave system with the Military Services for Directed Energy Frontline Electromagnetic Neutralization and Defeat (DEFEND).</li> <li>- Initiate in-house government design effort of antenna for base defense and airborne applications.</li> <li>- Initiate in-house government design effort of new sources for airborne applications.</li> </ul> <p><b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 funding decreased compared to FY 2024 by \$62.098 million due to re-prioritization to meet the nation's future security needs.</p>				
<b>Accomplishments/Planned Programs Subtotals</b>		52.455	87.148	25.050
<b>C. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				
Not Applicable				
<b>D. Acquisition Strategy</b>				
Not Applicable				

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603680F / <i>Manufacturing Technology Program</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	261.998	44.422	34.730	0.000	34.730	38.494	44.345	46.978	47.293	Continuing	Continuing
635280: <i>Manufacturing Technologies</i>	-	261.998	44.422	34.730	0.000	34.730	38.494	44.345	46.978	47.293	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

This program executes technical efforts to develop and maintain an affordable and reliable industrial base and manufacturing capability responsive to Department of the Air Force warfighter needs. The program develops and improves manufacturing technologies and processes to reduce transition risk, enable cost reduction, improve component and system quality, increase readiness and affordable mission availability, enhance industrial capability, and promote transformation through the industrial base. Value stream modifications and manufacturing throughput improvements are implemented to shorten weapon system cycle times during design, development, production, and sustainment. Cost savings are realized through early engagement with stakeholders to promote producible designs, ensuring the industrial base will be ready to manufacture at the needed quantities. Manufacturing technologies objectives are conducted through industrial partnerships that enable targeted investment of manufacturing technologies and reduce risk in the industrial supply chain for existing weapon system upgrades and new warfighter systems. Efforts in the program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

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 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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.

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	<b>R-1 Program Element (Number/Name)</b> PE 0603680F I Manufacturing Technology Program
---	--

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	270.959	44.422	44.256	0.000	44.256
Current President's Budget	261.998	44.422	34.730	0.000	34.730
Total Adjustments	-8.961	0.000	-9.526	0.000	-9.526
• 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	-7.051	0.000			
• Other Adjustments	-1.910	0.000	-9.526	0.000	-9.526

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 635280: *Manufacturing Technologies*

- Congressional Add: *Program increase - technologies to repair fastener holes*
- Congressional Add: *Program increase - manufacturing technology for reverse engineering*
- Congressional Add: *Program increase - thermal protection systems for hypersonics*
- Congressional Add: *Program increase - academic-industry partnerships for advanced materials and manufacturing processes*
- Congressional Add: *Program increase - adaptive modeling for low-cost titanium*
- Congressional Add: *Program increase - beryllium additive manufacturing*
- Congressional Add: *Program increase - MRO advanced process technology development*
- Congressional Add: *Program increase - virtual augmented mixed reality readiness*
- Congressional Add: *Program increase - affordable manufacture of resistive films*
- Congressional Add: *Program increase - rapid large format metal additive manufacturing to optimize scramjet production*
- Congressional Add: *Program increase - additive manufacturing qualification*
- Congressional Add: *Program increase - composites for advanced air mobility*
- Congressional Add: *Program increase - digital engineering work cell*
- Congressional Add: *Program increase - gallium oxide for high power electronics*
- Congressional Add: *Program increase - vertical integration of scramjet supply chain*

	<b>FY 2023</b>	<b>FY 2024</b>
	4.870	0.000
	4.870	0.000
	9.740	0.000
	5.844	0.000
	4.870	0.000
	2.922	0.000
	9.740	0.000
	7.792	0.000
	9.740	0.000
	7.305	0.000
	4.870	0.000
	9.740	0.000
	4.870	0.000
	4.870	0.000
	9.740	0.000



**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	<b>R-1 Program Element (Number/Name)</b> PE 0603680F I Manufacturing Technology Program
---	--

<b>Congressional Add Details (\$ in Millions, and Includes General Reductions)</b>	<b>FY 2023</b>	<b>FY 2024</b>
Congressional Add: <i>Program increase - low-cost rapid aerospace fabrication technology</i>	6.331	0.000
Congressional Add: <i>Program increase - smart manufacturing digital thread initiative</i>	9.740	0.000
Congressional Add: <i>Program increase - trusted metal additive manufacturing</i>	9.740	0.000
Congressional Add: <i>Program increase - additive manufacturing industrial base and capability expansion</i>	9.740	0.000
Congressional Add: <i>Program increase - agile factory floor for depot sustainment</i>	5.162	0.000
Congressional Add: <i>Program increase - F-35 agnostic battery development</i>	9.545	0.000
Congressional Add: <i>Program increase - high temperature hypersonic aeroshell</i>	5.844	0.000
Congressional Add: <i>Program increase - large -scale metal 3D printing</i>	9.740	0.000
Congressional Add: <i>Program increase - low cost manufacturing methods for hypersonic vehicle components</i>	4.870	0.000
Congressional Add: <i>Program increase - tools and processes for affordable high temperature composites</i>	8.766	0.000
Congressional Add: <i>Program increase - nanocomposite coatings advanced research</i>	9.740	0.000
Congressional Add: <i>Program increase - digital engineering enabled workforce development</i>	6.818	0.000
Congressional Add: <i>Program increase - alternative domestic rubber production</i>	4.967	0.000
Congressional Add: <i>Program increase - hypersonic manufacturing capability and supply</i>	4.870	0.000
Congressional Add: <i>Program increase - advanced air mobility in NEO environment</i>	9.740	0.000
Congressional Add Subtotals for Project: 635280	217.396	0.000
Congressional Add Totals for all Projects	217.396	0.000

**Change Summary Explanation**

Decrease in FY 2025 funding is due to movement of some work to Unites States Space Force Research, Development, Test & Evaluation and re-prioritization to meet the nation's future security and due to re-prioritization to meet the nation's future security needs.

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Affordable Mission Availability	14.328	13.327	11.088
<b>Description:</b> Develop and transition pervasive manufacturing technologies for affordable mission availability of Department of the Air Force components and systems.			
<b>FY 2024 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603680F / <i>Manufacturing Technology Program</i>
--	---

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Continue advancing high demand specialized manufacturing technologies to develop cost effective conventional production, overhaul, and specialty material repair technologies to enable affordable sustainment of aircraft systems. Continue developing cost-effective manufacturing and repair processes to meet specific needs of Programs of Record and depots. Continue developing manufacturing methods to meet the needs of next generation hypersonic platforms. Continue developing and demonstrating the manufacturability of materials, processes and devices for command and control communication technologies, intelligence, surveillance and reconnaissance systems, and RF, digital and power management components. Continue manufacturing repair technologies for turbine engine components. Continue manufacturing technologies for high temperature sensors and windows.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue advancing high demand specialized manufacturing technologies to develop cost effective conventional production, overhaul, and specialty material repair technologies to enable affordable sustainment of aircraft systems.</li> <li>- Continue developing cost-effective manufacturing and repair processes to meet specific needs of Programs of Record and depots.</li> <li>- Continue developing manufacturing methods to meet the needs of next generation hypersonic platforms.</li> <li>- Continue developing and demonstrating the manufacturability of materials, processes and devices for command and control communication technologies, intelligence, surveillance and reconnaissance systems, and RF, digital and power management components.</li> <li>- Continue manufacturing repair technologies for turbine engine components.</li> <li>- Continue manufacturing technologies for high temperature sensors and windows.</li> <li>- In FY 2025 and beyond work in manufacturing for intelligence, surveillance and reconnaissance systems and high temperature components for space-based platforms will be accomplished in 3620F: Research, Development, Test &amp; Evaluation, Space Force; Program 1206616SF: Space Advanced Technology Development/Demo; Project 633834: Project Integrated Space Technology Demonstrations; Effort: Manufacturing for Space Systems</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 decreased compared to FY 2024 by \$2.239 million due to movement of \$2.194 million of research to USSF program as shown in FY 2025 plans and due to decreased emphasis on repair technologies for turbine engines.</p>			
<p><b>Title:</b> Advanced Manufacturing Technologies</p> <p><b>Description:</b> Develop and transition affordable advanced manufacturing for Department of the Air Force fielded and future platforms.</p> <p><b>FY 2024 Plans:</b> Continue enabling and promoting advanced manufacturing processes, techniques, and equipment availability for reducing materiel acquisition, maintenance and repair costs. Continue developing and demonstrate intelligent robotics and digital</p>	20.723	22.211	14.787

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603680F / <i>Manufacturing Technology Program</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>engineering concepts into manufacturing processes. Continue developing, demonstrating and evaluating additively manufactured aerospace components and subcomponents. Continue developing and demonstrating technologies enabling factory of the future, digital supply chain management, and industrial internet of things to provide improvements in production, delivery and support of warfighter capabilities.</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Continue enabling and promoting advanced manufacturing processes, techniques, and equipment availability for reducing materiel acquisition, maintenance and repair costs.</li> <li>- Continue developing and demonstrating digital engineering concepts into manufacturing processes.</li> <li>- Continue developing, demonstrating and evaluating additively manufactured aerospace components and subcomponents.</li> <li>- Continue developing and demonstrating technologies enabling factory of the future, digital supply chain management, and industrial internet of things to provide improvements in production, delivery and support of warfighter capabilities.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$7.424 million. Funding decrease is due to re-prioritization to meet the nation's future security needs.</p>				
<p><b>Title:</b> Manufacturing for the Future Force</p> <p><b>Description:</b> Develop and transition manufacturing technologies that enable advanced technology solutions that will shape the future force across the air, space and cyberspace domains. Prior to FY2024 this effort was titled, "Manufacturing for Transformational Technologies."</p> <p><b>FY 2024 Plans:</b> Continue development of high demand manufacturing technologies including low cost and attritable systems, thermal protection materials for high temperature applications and other manufacturing technologies geared toward realizing the future force and to provide a cost-imposing strategy against adversarial forces.</p> <p><b>FY 2025 Plans:</b> - Continue development of high demand manufacturing technologies including low cost and attritable systems, thermal protection materials for high temperature applications and other manufacturing technologies geared toward realizing the future force and to provide a cost-imposing strategy against adversarial forces.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$0.029 million due to re-prioritization to meet the nation's future security needs.</p>		9.551	8.884	8.855
<b>Accomplishments/Planned Programs Subtotals</b>		44.602	44.422	34.730

**UNCLASSIFIED**

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force		Date: March 2024	
Appropriation/Budget Activity	R-1 Program Element (Number/Name)		
3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	PE 0603680F I Manufacturing Technology Program		
	<b>FY 2023</b>	<b>FY 2024</b>	
<b>Congressional Add:</b> Program increase - technologies to repair fastener holes	4.870	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - manufacturing technology for reverse engineering	4.870	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - thermal protection systems for hypersonics	9.740	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - academic-industry partnerships for advanced materials and manufacturing processes	5.844	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - adaptive modeling for low-cost titanium	4.870	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - beryllium additive manufacturing	2.922	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - MRO advanced process technology development	9.740	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - virtual augmented mixed reality readiness	7.792	0.000	

**UNCLASSIFIED**

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force		Date: March 2024	
Appropriation/Budget Activity	R-1 Program Element (Number/Name)		
3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	PE 0603680F I Manufacturing Technology Program		
	<b>FY 2023</b>	<b>FY 2024</b>	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - affordable manufacture of resistive films	9.740	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - rapid large format metal additive manufacturing to optimize scramjet production	7.305	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - additive manufacturing qualification	4.870	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - composites for advanced air mobility	9.740	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - digital engineering work cell	4.870	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - gallium oxide for high power electronics	4.870	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - vertical integration of scramjet supply chain	9.740	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - low-cost rapid aerospace fabrication technology	6.331	0.000	

**UNCLASSIFIED**

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force		Date: March 2024	
Appropriation/Budget Activity	R-1 Program Element (Number/Name)		
3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	PE 0603680F I Manufacturing Technology Program		
	<b>FY 2023</b>	<b>FY 2024</b>	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - smart manufacturing digital thread initiative	9.740	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - trusted metal additive manufacturing	9.740	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - additive manufacturing industrial base and capability expansion	9.740	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - agile factory floor for depot sustainment	5.162	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - F-35 agnostic battery development	9.545	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - high temperature hypersonic aeroshell	5.844	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - large -scale metal 3D printing	9.740	0.000	
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - low cost manufacturing methods for hypersonic vehicle components	4.870	0.000	

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024	
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force</i> / BA 3: <i>Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0603680F / <i>Manufacturing Technology Program</i>	
		<b>FY 2023</b>	<b>FY 2024</b>
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - tools and processes for affordable high temperature composites		8.766	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - nanocomposite coatings advanced research		9.740	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - digital engineering enabled workforce development		6.818	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - alternative domestic rubber production		4.967	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - hypersonic manufacturing capability and supply		4.870	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Add:</b> Program increase - advanced air mobility in NEO environment		9.740	0.000
<b>FY 2023 Accomplishments:</b> Conducted Congressionally directed efforts.			
<b>FY 2024 Plans:</b> Not applicable			
<b>Congressional Adds Subtotals</b>		217.396	0.000
<b>D. Other Program Funding Summary (\$ in Millions)</b>			
N/A			
<b>Remarks</b>			

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603680F / <i>Manufacturing Technology Program</i>
--	---

**E. Acquisition Strategy**  
N/A



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	50.138	37.779	26.172	0.000	26.172	31.468	36.409	37.745	38.535	Continuing	Continuing
635321: <i>C4I Battlespace Dev and Demo</i>	-	32.633	24.682	16.925	0.000	16.925	18.544	21.015	21.786	22.242	Continuing	Continuing
635329: <i>Cyber Battlespace Dev &amp; Demo</i>	-	17.505	13.097	9.247	0.000	9.247	12.924	15.394	15.959	16.293	Continuing	Continuing

**A. Mission Description and Budget Item Justification**

This program develops and demonstrates Air Force enterprise-centric information technologies for the warfighter. The C4I Battlespace Dev and Demo project provides technology enabling the Air Force (a) to monitor, assess, plan, and execute missions rapidly across the full spectrum of operations at all levels of war and during all phases of conflict; (b) to field advanced, secure, net-enabled architectures and communications/network technologies in support of persistent, global, and survivable kinetic and non-kinetic military operations; (c) to process and exploit data and information from a variety of sources and domains to create a common operating picture of the battlespace; and (d) to provide the decision maker and staff with seamless access to tailored information within a mobile, dynamic, and scalable, globally distributed Air Operations Center, as well as among other producers, consumers, and managers of information relevant to other particular Communities of Interest (COI). The Cyber Battlespace Dev & Demo project develops the ability to deliver cyber-attack capabilities (access, stealth, persistence, intelligence, and weapons delivery), cyber defense capabilities (attack detection, attack attribution, and response automation) and cyber support capabilities (situation awareness and war gaming). This project will also develop (a) a science and engineering capability demonstrating new models of computation; (b) novel approaches for high performance, interactive, net-centric, distributed and embedded computing systems; and (c) the technological tools enabling affordable, large-scale, and complex software-intensive systems.

The National Defense Strategy and Air Force Future Operating Concept established science and technology challenges to enable operational agility (the ability to rapidly generate and shift among multiple solutions for a given challenge) as a way to adapt swiftly to any situation or enemy action. Operational agility will require flexibility (manifested as multi-domain operations), speed (manifested as superior decision speed), coordination (manifested as dynamic command and control), balance (manifested as presenting a balanced capability mix), and strength (manifested as performance-optimized teams). In order to enable operational agility, this program will begin to shape future research and development (R&D) to focus on technologies in support of operational agility through multi-domain command and control (MDC2) capabilities.

This program has been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

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 the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>
--	--

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>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	55.919	37.779	39.528	0.000	39.528
Current President's Budget	50.138	37.779	26.172	0.000	26.172
Total Adjustments	-5.781	0.000	-13.356	0.000	-13.356
• 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	-2.090	0.000			
• SBIR/STTR Transfer	-2.136	0.000			
• Other Adjustments	-1.555	0.000	-13.356	0.000	-13.356

**Congressional Add Details (\$ in Millions, and Includes General Reductions)**

**Project:** 635321: *C4I Battlespace Dev and Demo*

Congressional Add: *Program Increase - Assured Communication and Networks*

Congressional Add: *Program Increase - Non-PKI Based Advanced Encryption Modalities*

Congressional Add Subtotals for Project: 635321

Congressional Add Totals for all Projects

	<b>FY 2023</b>	<b>FY 2024</b>
	9.707	-
	6.795	-
	16.502	-
	16.502	-

**Change Summary Explanation**

Decrease in FY 2025 funding is due to re-prioritization to meet the nation's future security needs.

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>				<b>Project (Number/Name)</b> 635321 / <i>C4I Battlespace Dev and Demo</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
635321: <i>C4I Battlespace Dev and Demo</i>	-	32.633	24.682	16.925	0.000	16.925	18.544	21.015	21.786	22.242	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

The National Defense Strategy and Air Force Future Operating Concept established science and technology challenges to enable operational agility (the ability to rapidly generate and shift among multiple solutions for a given challenge) as a way to adapt swiftly to any situation or enemy action. In order to enable multi-domain operations, this project will begin to shape future research and development to focus on technologies in support of multi-domain command and control.

In order to achieve operational agility, the Air Force must be able (a) to monitor, assess, plan, and execute missions rapidly across the full spectrum of operations at all levels of war and during all phases of conflict; (b) to field advanced, secure, net-enabled architectures and communications/network technologies in support of persistent, global, and survivable kinetic and non-kinetic military operations; (c) to process and exploit data and information from a variety of sources and domains to create a common operating picture of the battlespace; and (d) to provide the decision maker and staff with seamless access to tailored information within a mobile, dynamic, and scalable, globally distributed Air Operations Center, as well as among other producers, consumers, and managers of information relevant to other particular Communities of Interest (COI).

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Multi-Domain Command and Control	7.298	10.118	4.780
<b>Description:</b> Perform research and development that will advance existing, or discover new, command and control capabilities to support multi-domain operations for air, space, cyberspace, land, sea, and undersea.			
<b>FY 2024 Plans:</b> Continue demonstration of communication, information management, and replication capabilities for intra base distribution of one Command and Control operational echelon function. Continue executing experiments, based on operational scenarios, which incorporate process management execution into the extensible Space command and control framework, and which integrate disparate data and applications, providing a pedigree for proposed tasking options to decision makers. Continue development of tools, technology, and framework for execution management of operational center process workflows and applications. Initiate demonstration of a fused installation security architecture- air, ground, and cyber, multi-mission Unmanned Air System "wingmen" for installation security capabilities. Initiate development and demonstration of distributed operational-echelon Command and Control deployable kits for rapid distribution and dispersion of Air Operations Center functions theater-wide.			
<b>FY 2025 Plans:</b>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	<b>Project (Number/Name)</b> 635321 / <i>C4I Battlespace Dev and Demo</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<ul style="list-style-type: none"> <li>- Initiate advanced development and demonstration of a triple component system to support both single Joint Air-to-Surface Standoff Missile (JASSM) and multi-JASSM planning from airborne platforms.</li> <li>- Initiate advanced development and demonstration of an an Artificial Intelligence (AI)-enhanced planning capability and battle management architecture at a relevant AF exercise with operationally relevant data to support a common operational picture for selection, tracking, and deployment of AI capabilities in-mission.</li> <li>- Complete demonstration of communication, information management, and replication capabilities for intra-base distribution of Command and Control (C2) operational echelon kits for rapid distribution and dispersion of Air Operations Center functions theater-wide.</li> <li>- Complete execution of experiments, based on operational scenarios, which incorporate process management execution into the extensible Space command and control framework, and which integrate disparate data and applications, providing a pedigree for proposed tasking options to decision makers.</li> <li>- Complete development of tools, technology, and a framework for execution management of operational center process workflows and applications.</li> <li>- Complete demonstration of a fused installation security architecture- air, ground, and cyber, multi-mission Unmanned Air System (UAS) "wingmen" for installation security capabilities.</li> <li>- Complete development of robust artificial intelligence/machine learning for targeted transition capabilities.</li> <li>- Complete development and implementation of state of the art learning models.</li> <li>- Complete integration within the StreamlinedML framework.</li> <li>- Complete implementation and testing of neuromorphic based algorithms for processing and exploitation of multiple data feeds.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$5.338 million due to re-prioritization to meet the nation's future security needs. This thrust has also decreased emphasis in the area of installation security architecture and Unmanned Air System asset management for assured base operations, and in the area of communication and information management for distributed air operations centers (AOCs). Research efforts from the Artificial Intelligence/Autonomy/Machine Learning thrust within the overarching project are being moved to this thrust.</p>			
<p><b>Title:</b> Artificial Intelligence/Autonomy/Machine Learning</p> <p><b>Description:</b> Develop and demonstrate the ability to harness the speed and scale of computers and machines to address problems of complexity.</p> <p><b>FY 2024 Plans:</b> Continue development of robust artificial intelligence/machine learning for targeted transition capabilities. Continue development operationalizing and implement state of the art learning models. Continue to integrate within the StreamlinedML framework.</p>	1.527	2.774	0.000

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	<b>Project (Number/Name)</b> 635321 / <i>C4I Battlespace Dev and Demo</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>Complete development of secure diode for cross-domain embedded solution. Continue implementing and testing neuromorphic-based algorithms for processing and exploitation of multiple data feeds.</p> <p><b>FY 2025 Plans:</b> - In FY 2025, this research is continued in the Multi-Domain Command and Control thrust.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$2.774 million due to research efforts in this thrust being moved to the Multi-Domain Command and Control thrust.</p>				
<p><b>Title:</b> Data to Decisions</p> <p><b>Description:</b> Develop and demonstrate the collection, management, analysis, and exploitation of complex data for availability to Air Force and other stakeholders.</p> <p><b>FY 2024 Plans:</b> Continue development and demonstration of intelligence analysis capabilities from multiple intelligence sources for both near-real time and post mission. Continue research and development in data analytics and strategic indications and warnings for the air and space domains. Continue performing service-based capability development. Complete efforts advancing systems to deliver multi-INT exploitation on-board and in real-time. Continue software development for automatic detection, characterization, and classification of relative maneuver behaviors between multiple resident space objects.</p> <p><b>FY 2025 Plans:</b> - Initiate integration of targeting and communications technologies for rapid dynamic targeting of high-mobility enemy threat systems, focusing on interoperability between technologies. - Complete development and demonstration of intelligence analysis capabilities from multiple intelligence sources for both near-real time and post mission. - Complete research and development in data analytics and strategic indications and warnings for the air and space domains. - Complete performing service-based capability development. - Complete software development for automatic detection, characterization, and classification of relative maneuver behaviors between multiple resident space objects.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding increased compared to FY 2024 by \$0.986 million due to re-prioritization to meet the nation's future security needs. Justification for the increase is described in the plans above.</p>		1.267	2.444	3.430
<p><b>Title:</b> Game Changing Computing Power</p>		1.551	2.805	1.833

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	<b>Project (Number/Name)</b> 635321 / <i>C4I Battlespace Dev and Demo</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>Description:</b> Develop and demonstrate computer architectures with greater capacity and sophistication to enable game-changing computing power to the warfighter anywhere, anytime.</p> <p><b>FY 2024 Plans:</b> Continue demonstrating secure, on-board, simultaneous processing of multi-INT data to correlate and identify surface targets. Complete integration and testing to utilize pod for additional data sources. Continue development of artificial intelligence/machine learning for data sources with correlation and automated alert to enable human-machine tip and cue on surrogate platform.</p> <p><b>FY 2025 Plans:</b> - Complete demonstration of secure, on-board, simultaneous processing of multi-INT data to correlate and identify surface targets. - Complete development of artificial intelligence/machine learning for data sources with correlation and automated alerts to enable human-machine tip and cue on surrogate platform.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$0.972 million due to re-prioritization to meet the nation's future security needs. Justification for the decrease is described in the plans above.</p>			
<p><b>Title:</b> Assured Communications &amp; Networks</p> <p><b>Description:</b> Develop and demonstrate secure and reliable communications to ensure the delivery of timely, reliable, and actionable information to warfighters and systems.</p> <p><b>FY 2024 Plans:</b> Continue development and demonstration for rapid waveform development of multi-mission software defined radio frequency capability. Continue development of wideband high frequency waveform development and testing. Continue development of enhancing communication link availability prediction for better Command, Control, and Communications planning and simulation. Continue demonstrating a protected, single security domain commercial off-the-shelf device hosting user and asset tracking.</p> <p><b>FY 2025 Plans:</b> - Initiate the development of a low SWaP rapidly deployable information management system and development of a capability to support data compression, mission prioritization, &amp; intelligent caching over high and low-capacity data links. - Complete development and demonstration for rapid waveform development of multi-mission software defined radio frequency capability. - Complete development of wideband high frequency waveform development and testing. - Complete development of enhancing communication link availability prediction for better Command, Control, and Communications planning and simulation.</p>	4.488	6.541	6.882

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	<b>Project (Number/Name)</b> 635321 / <i>C4I Battlespace Dev and Demo</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
- Complete demonstration of a protected, single security domain commercial off-the-shelf device hosting user and asset tracking.			
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY 2025 funding increased compared to FY 2024 by \$0.341 million due to re-prioritization to meet the nation's future security needs. Justification for the increase is described in the plans above.			
<b>Accomplishments/Planned Programs Subtotals</b>	16.131	24.682	16.925

	<b>FY 2023</b>	<b>FY 2024</b>
<b><i>Congressional Add:</i></b> Program Increase - Assured Communication and Networks <b><i>FY 2023 Accomplishments:</i></b> Conduct Congressionally directed effort.	9.707	-
<b><i>Congressional Add:</i></b> Program Increase - Non-PKI Based Advanced Encryption Modalities <b><i>FY 2023 Accomplishments:</i></b> Conduct Congressionally directed efforts.	6.795	-
<b>Congressional Adds Subtotals</b>	16.502	-

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force										<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>				<b>Project (Number/Name)</b> 635329 / <i>Cyber Battlespace Dev &amp; Demo</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>FY 2028</b>	<b>FY 2029</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
635329: <i>Cyber Battlespace Dev &amp; Demo</i>	-	17.505	13.097	9.247	0.000	9.247	12.924	15.394	15.959	16.293	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**A. Mission Description and Budget Item Justification**

The Air Force requires the ability to deliver sovereign options in cyberspace through the development and integration of cyber-attack, cyber defense, and cyber support technologies for a strategic capability of cyber dominance. This project develops the ability to deliver cyber-attack capabilities (access, stealth, persistence, intelligence, and weapons delivery), cyber defense capabilities (attack detection, attack attribution, and response automation) and cyber support capabilities (situation awareness and war gaming). This project will also develop 1) a science and engineering capability demonstrating new models of computation, 2) novel approaches for high performance, interactive, net-centric, distributed and embedded computing systems, and 3) the technological tools enabling affordable, large-scale, and complex software-intensive systems.

The National Defense Strategy and Air Force Future Operating Concept established science and technology challenges to enable operational agility (the ability to rapidly generate and shift among multiple solutions for a given challenge) as a way to adapt swiftly to any situation or enemy action. In order to enable multi-domain operations, this project will begin to shape future research and development to focus on cyber technologies in support of multi-domain command and control.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> Cyber Defense Technologies	3.789	3.219	0.000
<b>Description:</b> Develop and demonstrate defensive cyber operations capabilities in a series of experimental technology demonstrations.			
Starting in FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust.			
<b>FY 2024 Plans:</b> Continue development of software capabilities and concept of operations for active guidance and automated processes addressing cyber defense. Continue demonstration of automated cyber survivability using integrated cyber technologies within the operational system laboratory in the context of risk management framework requirements. Continue development of an advanced secure processor hardware capability. Continue development, demonstration, and integration of the Project IKE Cyber system (an end-to-end military system and cyber mission execution framework). Initiate research into dynamic management tailored towards unmanned aerial systems.			
<b>FY 2025 Plans:</b>			



**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	<b>Project (Number/Name)</b> 635329 / <i>Cyber Battlespace Dev &amp; Demo</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
- In FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust.				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$3.219 million due to research being moved from the Cyber Defense Technologies thrust to the Cyber Offensive and Defensive Technologies thrust.				
<b>Title:</b> Cyber Offense Technologies		13.716	9.878	0.000
<b>Description:</b> Develop and demonstrate offensive cyber operations capabilities in a series of experimental technology demonstrations.				
Starting in FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust.				
<b>FY 2024 Plans:</b> Continue the advancement of research towards development of non-kinetic cyber effects against high-impact, critical targets within Areas of Responsibility or Areas of Interest to enable stand-off power projection options that enable cyber-only and coordinated cyber-kinetic target prosecution. Continue development in signal identification capabilities in adverse environments addressing advanced communications signals and networks. Continue investments for the development of a counter small unmanned aerial system open architecture specification to enable interoperability between disparate protection systems. Continue development of a base-threat awareness toolkit. Continue development of processor-agnostic sub-system for golden-image storage, verification, and re-flashing. Continue investments to integrate and transition multiple Air Force Research Laboratory and Air Force Lifecycle Management Center counter small unmanned aerial system capabilities. Decrease investments for the development of a capability to enable the warfighter access into congested environments as directed by warfighter requirements. Continue investments for the development of cellular testbed with 5G and Internet of Things representative technologies. Complete demonstration of an initial SIGINT hardware prototype.				
<b>FY 2025 Plans:</b> - In FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust.				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY 2025 funding decreased compared to FY 2024 by \$9.878 million due to research being moved from the Cyber Offense Technologies thrust to the Cyber Offensive and Defensive Technologies thrust.				
<b>Title:</b> Cyber Offensive and Defensive Technologies		0.000	0.000	9.247
<b>Description:</b> Develop and demonstrate cyber warfighting, assurance, and electromagnetic (EM) convergence capabilities in a series of experiments in operationally relevant environments.				

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	<b>Project (Number/Name)</b> 635329 / <i>Cyber Battlespace Dev &amp; Demo</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p>For FY 2024 and prior years, these activities were performed in the Cyber Defense Technologies and Cyber Offense Technologies thrust.</p> <p><b>FY 2024 Plans:</b> Not applicable</p> <p><b>FY 2025 Plans:</b></p> <ul style="list-style-type: none"> <li>- Initiate development of 5G cyber operations tool suite for integration into DAF cyber operations platforms.</li> <li>- Initiate development of 5G exploitation tools for Intelligence, Surveillance, and Reconnaissance (ISR) and for Offensive Cyber Operations (OCO) capabilities.</li> <li>- Continue the development of a counter small unmanned aerial system open architecture specification to enable interoperability between disparate protection systems.</li> <li>- Continue integration and transition of multiple Air Force Research Laboratory and Air Force Lifecycle Management Center counter small unmanned aerial system capabilities.</li> <li>- Complete development of software capabilities and concept of operations for active guidance and automated processes addressing cyber defense.</li> <li>- Complete the demonstration of automated cyber survivability using integrated cyber technologies within the operational system laboratory in the context of risk management framework requirements.</li> <li>- Complete development of an advanced secure processor hardware capability.</li> <li>- Complete development, demonstration, and integration of the Project IKE Cyber system (an end-to-end military system and cyber mission execution framework).</li> <li>- Complete research into dynamic management tailored towards unmanned aerial systems.</li> <li>- Complete the advancement of research towards development of non-kinetic cyber effects against high-impact, critical targets within Areas of Responsibility or Areas of Interest to enable stand-off power projection options that enable cyber-only and coordinated cyber-kinetic target prosecution.</li> <li>- Complete development of signal identification capabilities in adverse environments addressing advanced communications signals and networks.</li> <li>- Complete development of a base-threat awareness toolkit.</li> <li>- Complete development of a processor-agnostic sub-system for golden-image storage, verification, and re-flashing.</li> <li>- Complete the development of a capability to enable the warfighter access into congested environments as directed by warfighter requirements.</li> <li>- Complete investments for the development of a cellular testbed with 5G and Internet of Things representative technologies.</li> </ul> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>			

**UNCLASSIFIED**

<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	<b>Project (Number/Name)</b> 635329 / <i>Cyber Battlespace Dev &amp; Demo</i>

<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY 2025 funding increased compared to FY 2024 by \$9.247 million due to consolidation of the Cyber Defense Technologies and the Cyber Offense Technologies thrusts into a single Cyber Offensive and Defensive Technologies thrust.			
<b>Accomplishments/Planned Programs Subtotals</b>	17.505	13.097	9.247

**C. Other Program Funding Summary (\$ in Millions)**

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

UNCLASSIFIED

THIS PAGE INTENTIONALLY LEFT BLANK

UNCLASSIFIED

**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	27.762	0.000	27.762	28.403	28.985	30.034	30.628	Continuing	Continuing
630004: <i>Deployment and Distribution Development &amp; Proto</i>	-	0.000	0.000	27.762	0.000	27.762	28.403	28.985	30.034	30.628	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**Note**

- This program, BA 3, PE 0604776F, project 630004, Autonomous Pallet Loader, is a new start.
- This program, BA 3, PE 0604776F, project 630004, Dynamic Intelligent Analysis Notification, is a new start.
- This program, BA 3, PE 0604776F, project 630004, Distributed Littoral Ops Fuel Transfer, is a new start.
- This program, BA 3, PE 0604776F, project 630004, Information Summarization for Complex Knowledge Management, is a new start.
- This program, BA 3, PE 0604776F, project 630004, Internal Sling-load Unit Airdrop, is a new start.
- This program, BA 3, PE 0604776F, project 630004, Jet Augmented Glider, is a new start.
- This program, BA 3, PE 0604776F, project 630004, Sustainment Support Network for Autonomous Aerial Resupply Vehicles, is a new start.
- This program, BA 3, PE 0604776F, project 630004, System for Expeditionary Port Assessment and Repair, is a new start.
- This program, BA 3, PE 0604776F, project 630004, Automatic Landing Zone, is a new start.

Starting in FY25 the PE was split between two project codes (BA3 630004 and BA4 640216)

**A. Mission Description and Budget Item Justification**

Provides for the collaborative development, integration, lab demonstration and assessment of contested environment JDDE and JPE capabilities. Needed capabilities include: innovation in delivery methods, seaport and airfield improvements, inventory/cargo management, materiel handling, cargo/container security, secure collaboration with commercial/interagency/coalition partners, and distributed global mobility C4

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.

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	<b>R-1 Program Element (Number/Name)</b> PE 0604776F I Deployment & Distribution Enterprise R&D
---	--

<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	27.762	0.000	27.762
Total Adjustments	0.000	0.000	27.762	0.000	27.762
• 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	27.762	0.000	27.762

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> TRANSCOM Innovation  <b>Description:</b> Rapidly develop and integrate technology solutions for the enterprise  <b>FY 2024 Plans:</b> NA  <b>FY 2025 Plans:</b> Continue to pursue and develop solutions to identified challenges  <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216	0.000	0.000	1.515
<b>Title:</b> Data Lakes  <b>Description:</b> Demonstrating the value of a comprehensive user profiling system to threat intelligence, continuous authentication, and automated threat response.  <b>FY 2024 Plans:</b> FY24 plans in project 640216  <b>FY 2025 Plans:</b> Continue to demonstrate the value of a comprehensive user profiling system to threat intelligence, continuous authentication, and automated threat response.  <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b>	-	0.000	0.646

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY24 in project 640216				
<p><b>Title:</b> Airdrop Mission Planner Multiservice Interoperability</p> <p><b>Description:</b> Seamlessly conduct joint airdrop missions with a shared mission profile/solution between services</p> <p><b>FY 2024 Plans:</b> FY24 in project 640216</p> <p><b>FY 2025 Plans:</b> Streamline multiservice TTPs and regulation/instruction through the technical implementation</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216</p>		-	0.000	0.948
<p><b>Title:</b> End-to-End Distribution Modeling</p> <p><b>Description:</b> Developing the model of record for all programmatic analysis for transportation/distribution.</p> <p><b>FY 2024 Plans:</b> FY24 plans in project 640216</p> <p><b>FY 2025 Plans:</b> Continue to provide research and development to design and prototype foundational level changes to the AMP-Core simulation engine necessary to provide the appropriate framework to accommodate challenging capability requirements for evolving CONOPs, as well as to position the tool well to advance and sustain analytic capabilities.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216</p>		-	0.000	1.760
<p><b>Title:</b> Autonomous Pallet Loader</p> <p><b>Description:</b> A highly transportable, heavy-lift, autonomous material handling system</p> <p><b>FY 2024 Plans:</b> FY25 New Start</p> <p><b>FY 2025 Plans:</b> Update the mechanical and electrical sub-system designs</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>		-	0.000	0.450

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY25 New Start				
<p><b>Title:</b> Dynamic Intelligent Analysis Notification</p> <p><b>Description:</b> Produce a set of suggested mission changes based off the ultimate mission purpose and the associated constraints</p> <p><b>FY 2024 Plans:</b> FY25 New Start</p> <p><b>FY 2025 Plans:</b> Investigation of potential, streamlined use cases related to mission replanning to explore the use of generative AI within the 618th AOC and AMC/A9.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY25 New Start</p>		-	0.000	0.600
<p><b>Title:</b> Distributed Littoral Ops Fuel Transfer</p> <p><b>Description:</b> A portable towing and hauling device that can automatically traverse tensioned lines from ship to shore while hauling a flexible fueling hose</p> <p><b>FY 2024 Plans:</b> FY25 New Start</p> <p><b>FY 2025 Plans:</b> NSWC Carderock and USTRANSCOM to confirm requirements for technical performance and operational needs. System architecture established, feasibility calculations confirmed.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY25 New Start</p>		-	0.000	0.300
<p><b>Title:</b> Information Summarization for Complex Knowledge Management</p> <p><b>Description:</b> Create succinct summaries of related information samples, facilitating improved information discovery and understanding</p> <p><b>FY 2024 Plans:</b> FY25 New Start</p> <p><b>FY 2025 Plans:</b></p>		-	0.000	0.200



**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
Documentation describing identified use case(s) and challenges the prototype will address.# Documentation of the end-to-end process of gathering, organizing, and refining data from multiple sources. <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY25 New Start				
<b>Title:</b> Internal Sling-load Unit Airdrop <b>Description:</b> Capability to airdrop the Internal airlift/helicopter Slingable-Container Unit (ISU) from large, fixed-wing mobility aircraft <b>FY 2024 Plans:</b> FY25 New Start <b>FY 2025 Plans:</b> Develop ISU Airdrop Kit and ground testing <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY25 New Start		-	0.000	0.400
<b>Title:</b> Jet Augmented Glider <b>Description:</b> An autonomous long-range, low-cost, one-time use powered glider resupply vehicle which can be deployed from cargo aircraft, rotorcraft, ships, or from the ground <b>FY 2024 Plans:</b> FY25 New Start <b>FY 2025 Plans:</b> Design review and follow on design <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY25 New Start		-	0.000	1.000
<b>Title:</b> Sustainment Support Network for Autonomous Aerial Resupply Vehicles <b>Description:</b> Integrated solution that automatically sources, processes, synthesizes, and distributes data to aerial resupply vehicles <b>FY 2024 Plans:</b>		-	0.000	0.650

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>
--	---

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY25 New Start <b>FY 2025 Plans:</b> Data Collection and Integration <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY25 New Start			
<b>Title:</b> System for Expeditionary Port Assessment and Repair <b>Description:</b> Joint capability to counter asymmetric A2/AD seaport degradation activities by building on a suite of demonstrated port assessment and pier repair tools <b>FY 2024 Plans:</b> FY25 New Start <b>FY 2025 Plans:</b> Architecture Design and testing <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY25 New Start	-	0.000	0.500
<b>Title:</b> Aerial Delivery - Low Cost Modular GPS Denied Kit <b>Description:</b> Demonstrate a low size, weight, power and cost kit that can provide GPS-denied navigation, aerial delivery platforms <b>FY 2024 Plans:</b> FY24 plans in project 640216 <b>FY 2025 Plans:</b> Develop GPS denied software <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216	-	0.000	1.750
<b>Title:</b> Airdrop System - Precision Extended Glide <b>Description:</b> Demonstrate a long range powered parafoil system to reduce risk to delivery aircraft <b>FY 2024 Plans:</b>	-	0.000	1.600

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY24 plans in project 640216 <b>FY 2025 Plans:</b> Component integration and development <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216				
<b>Title:</b> Automatic Landing Zone <b>Description:</b> Aid selection of a LZ/DZ by presenting the user with a map-based course of action decision tool, at point of need <b>FY 2024 Plans:</b> FY25 New Start <b>FY 2025 Plans:</b> Begin system development <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY25 New Start		-	0.000	0.500
<b>Title:</b> Container Airdrop <b>Description:</b> Enable the airdrop of a standard 20ft ISO container from a C-17 utilizing standard low altitude airdrop methods <b>FY 2024 Plans:</b> FY24 plans in project 640216 <b>FY 2025 Plans:</b> Begin integration of components <b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216		-	0.000	1.133
<b>Title:</b> Expeditionary Concrete Construction for Ports of Debarkation <b>Description:</b> Use indigenous materials for contingency construction while minimizing logistics required to enable the construction		-	0.000	1.000

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	<b>R-1 Program Element (Number/Name)</b> PE 0604776F I Deployment & Distribution Enterprise R&D
---	--

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<p><b>FY 2024 Plans:</b> FY24 plans in project 640216</p> <p><b>FY 2025 Plans:</b> Begin integration of components</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216</p>			
<p><b>Title:</b> Global Reach</p> <p><b>Description:</b> Tactical Situation, COP, mission planning, intelligence, communications resiliency, ship survivability capabilities</p> <p><b>FY 2024 Plans:</b> FY24 plans in project 640216</p> <p><b>FY 2025 Plans:</b> Begin design development phase</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216</p>	-	0.000	2.328
<p><b>Title:</b> Scalable Autonomous Modular Propulsion Kits</p> <p><b>Description:</b> Develop scalable modular propulsion kits with marine automation for installation on ocean/riverine commercial barges</p> <p><b>FY 2024 Plans:</b> FY24 Plans in project 640216</p> <p><b>FY 2025 Plans:</b> Autonomous control system used to convert manned vessels to autonomous unmanned capability</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216</p>	-	0.000	1.000
<p><b>Title:</b> Enhanced Vision Navigation for Joint Precision Airdrop System</p>	-	0.000	0.550

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>
--	---

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
---	----------------	----------------	----------------

<p><b>Description:</b> Support to oversee the development of advanced technologies to improve airdrop and other capabilities to the warfighter.</p> <p><b>FY 2024 Plans:</b> FY24 in project 640216</p> <p><b>FY 2025 Plans:</b> Monitor projects progression to ensure costs, schedule, performance</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216</p>			
---	--	--	--

<p><b>Title:</b> AI-Powered Sensitive Data Masking</p> <p><b>Description:</b> Focus on masking structured data, building an organizational knowledge base, and masking unstructured data</p> <p><b>FY 2024 Plans:</b> FY24 plans in project 640216</p> <p><b>FY 2025 Plans:</b> Continue to Identify a focused subset of operational data that is commonly shared across trusted partners.</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216</p>	-	0.000	0.600
---	---	-------	-------

<p><b>Title:</b> Massachusetts Institute of Technology Lincoln Labs</p> <p><b>Description:</b> Partnership with MIT-LL to research efforts to improve enterprise operational architecture supporting high-end analytics, integrated information technology/data structures, understanding of cloud capabilities and multi-level cyber security defense.</p> <p><b>FY 2024 Plans:</b> FY24 plans in project 640216</p> <p><b>FY 2025 Plans:</b> Multiple efforts to increase decision support</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b></p>	-	0.000	3.100
--	---	-------	-------

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
FY24 in project 640216				
<p><b>Title:</b> Modeling &amp; Simulation Innovation</p> <p><b>Description:</b> Select student research/faculty-assisted projects (e.g., Joint Transportation Asset Scheduling Kit, Next Generation Cargo Capability, Applying Post Modern Portfolio Theory to Mitigate Risk in International Shipping, Optimal CH-47/C-130 Workload Balance, Remotely Piloted Aircraft Performing Airdrop Mission).</p> <p><b>FY 2024 Plans:</b> FY24 plans in project 640216</p> <p><b>FY 2025 Plans:</b> Collaboration partnership with AFIT for student research</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216</p>		-	0.000	0.125
<p><b>Title:</b> Aerial Delivery and Autonomous Deployment of Unmanned Vehicles</p> <p><b>Description:</b> Develop ability to deliver unmanned systems from existing airdrop systems</p> <p><b>FY 2024 Plans:</b> FY24 Plans in project 640216</p> <p><b>FY 2025 Plans:</b> Complete release mechanism for unmanned vehicle</p> <p><b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216</p>		-	0.000	0.564
<p><b>Title:</b> Program Execution</p> <p><b>Description:</b> Provide technical assistance and program management support to the USTRANSCOM RDT&amp;E Program.</p> <p><b>FY 2024 Plans:</b> FY24 plans in project 640216</p> <p><b>FY 2025 Plans:</b> Program support to explore technology solutions to capability gaps identified through Joint Concept Development documents, the Joint capabilities Integration and Development System process, Joint</p>		-	0.000	1.085

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force		<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>		<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>		
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
Experimentation, etc, to increase the responsiveness, efficiency and effectiveness of the Joint Deployment and Distribution Enterprise.				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216				
<b>Title:</b> Analyzer Driven Data Integrity		-	0.000	0.237
<b>Description:</b> Increase data integrity				
<b>FY 2024 Plans:</b> FY24 plans in project 640216				
<b>FY 2025 Plans:</b> Integrate plan design				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216				
<b>Title:</b> Strategic Theater Orchestration and Resource Management		-	0.000	0.665
<b>Description:</b> Provide ability more effectively and efficiently manage theater lift assets				
<b>FY 2024 Plans:</b> FY24 plans in project 640216				
<b>FY 2025 Plans:</b> Develop Strategic-Theater Scenarios				
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> FY24 in project 640216				
<b>Title:</b> JDDE Mission Assurance Coordinator		-	0.000	0.846
<b>Description:</b> Develop a JDDE-wide method for mission coordination				
<b>FY 2024 Plans:</b> FY24 plans in project 640216				
<b>FY 2025 Plans:</b>				

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force	<b>Date:</b> March 2024
--	-------------------------

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0604776F / <i>Deployment &amp; Distribution Enterprise R&amp;D</i>
--	---

<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>	FY 2023	FY 2024	FY 2025
Continue iterations of conceive, build, and test solutions			
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY24 in project 640216			
<b><i>Title:</i></b> Cyber Mission Assurance Technologies <b><i>Description:</i></b> Near real-time understanding of the operational impact of cyber risks, threats, and disruptions.	-	0.000	1.710
<b><i>FY 2024 Plans:</i></b> FY24 plans in project 640216			
<b><i>FY 2025 Plans:</i></b> Continue to develop integrated analysis/decision processes involving complex ops/cyber data by selecting pre-approved actions and coordinating stakeholders in the fight-through of cyber risks/disruptions to executing missions and Cyber Critical Asset Lists			
<b><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></b> FY24 in project 640216			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	0.000	27.762

**D. Other Program Funding Summary (\$ in Millions)**  
N/A

**Remarks**

**E. Acquisition Strategy**  
Requirements for joint deployment and distribution enterprise technology enhancements are annually identified, validated and prioritized by the Joint Deployment & Distribution Enterprise (JDDE) community. Pursuit of the development of new/improved capabilities to meet these requirements is managed by the United States Transportation Command (USTRANSCOM). Prototype products, once evaluated by the users, are spirally transitioned by the operational community.



**UNCLASSIFIED**

**Exhibit R-2, RDT&E Budget Item Justification:** PB 2025 Air Force **Date:** March 2024

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0207412F I <i>Control and Reporting Center (CRC)</i>
--	---

COST (\$ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	0.000	2.005	2.012	0.000	2.012	0.000	0.000	0.000	0.000	0.000	4.017
635321: <i>C4I Battlespace Dev &amp; Demo</i>	-	0.000	2.005	2.012	0.000	2.012	0.000	0.000	0.000	0.000	0.000	4.017
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-	-	-

**A. Mission Description and Budget Item Justification**

The Air Force does not have an enterprise solution for multi-domain battlespace awareness and command and control (C2) tools below the Air Operations Center (AOC) level. This presents significant challenges in obtaining a Common Operating Picture (COP) capable of disaggregation from the AOC, particularly at Anderson AFB, Guam which is the center hub in the Air Force's Agile Combat Employment (ACE) capability in the Pacific. Sharing a COP with the AOC is essential at peacetime for defense and at wartime for conducting operations, and the lack of a current solution further complicates the conduct of ACE operations.

Incorporating emerging technology into major operational exercises informs and refines Warfighter requirements and provides opportunities for early adoption and Tactics, Techniques, and Procedures (TTPs) development. Utilizing operationally relevant conditions also provides early opportunities for learning and materiel deficiency discovery. Efforts explore technology advancement to provide a common operating picture in support of Agile Combat Employment (ACE).

FY2025 funds will be used to develop and incorporate the latest commercial or government solutions into our operations to help identify best-of-breed technology, permit feedback to developers for improvements and refine operational tactics, techniques, and procedures (TTPs) for the conduct of ACE. Deployment will initially be in Guam to enable learning and assessment of tools under real operating conditions and crucially to create a sub-AOC COP at the heart of our ACE operations in the Pacific immediately. Funds will be used to support experimentation with and deployment of the sub-AOC capability including TTP delineation.

Fiscal Year (FY) 2025 Pacific Deterrence Initiative (PDI) funding accounted for in the Base budget total [\$2.012M] supports Battlespace Awareness.

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.

**UNCLASSIFIED**

<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2025 Air Force				<b>Date:</b> March 2024		
<b>Appropriation/Budget Activity</b> 3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)		<b>R-1 Program Element (Number/Name)</b> PE 0207412F I Control and Reporting Center (CRC)				
<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025 Base</b>	<b>FY 2025 OCO</b>	<b>FY 2025 Total</b>	
Previous President's Budget	0.000	2.005	2.012	0.000	2.012	
Current President's Budget	0.000	2.005	2.012	0.000	2.012	
Total Adjustments	0.000	0.000	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	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	0.000	0.000	0.000	
<b>C. Accomplishments/Planned Programs (\$ in Millions)</b>				<b>FY 2023</b>	<b>FY 2024</b>	<b>FY 2025</b>
<b>Title:</b> C2/Battlespace Awareness Tools				0.000	2.005	2.012
<b>Description:</b> Integrating emerging technologies into major exercises						
<b>FY 2024 Plans:</b> Identify, develop, integrate and field emerging technologies Testing of tools to provide a common operating picture						
<b>FY 2025 Plans:</b> Continue to identify, develop, integrate and field emerging technologies Continue to test tools to provide a common operating picture						
<b>FY 2024 to FY 2025 Increase/Decrease Statement:</b> Minimal change captures inflation adjustment						
<b>Accomplishments/Planned Programs Subtotals</b>				0.000	2.005	2.012
<b>D. Other Program Funding Summary (\$ in Millions)</b> N/A						
<b>Remarks</b>						
<b>E. Acquisition Strategy</b> N/A						